MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 8 MAY, 1936 Number 12

A Magazine for Mechanical Executives: Construction Production Maintenance

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Published monthly by Gardner Publications, Inc., 704 Race St., Cincinnati, Ohio.

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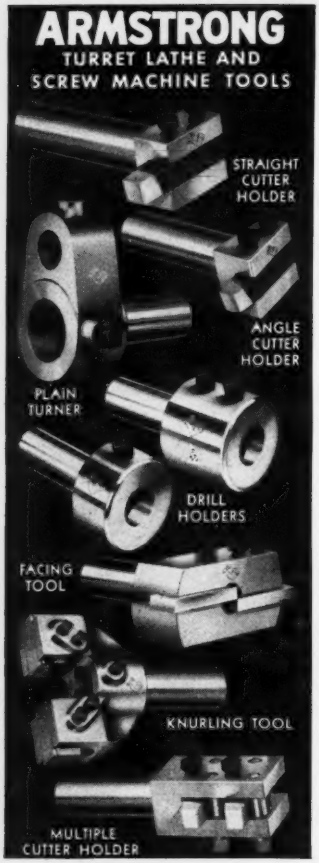

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MODERN Machine Shop

CINCINNATI, OHIO VOL. 8, NO. 12

MAY, 1936

Machine Operations in a Shipbuilding Plant

(Conclusion)

BY HOWARD CAMPBELL

IN selecting new machinery for the shipbuilding machine shop, an effort is made as far as possible to avoid single purpose machines and to buy machines that can be used on a wide variety of jobs. Many of the operations which recur on each new contract could be done faster and cheaper with a machine specially adapted for the job, rather than than to use one of the present machines with special rigging for the job, but the special machine would stand idle a large part of the time and would, therefore, be unprofiitable in the end.

The same consideration is necessary when the question of special jigs, fixtures, and tools comes up. The paramount question is whether the special tools or devices will pay for themselves either in making the operation quicker and cheaper, freeing the machine upon which the oper-

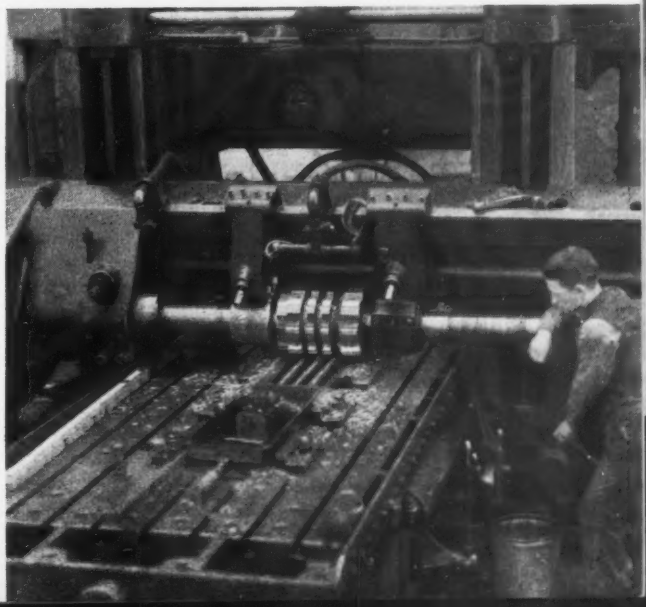

Fig. 18.—Special tooling for a "small lot" job. This setup is economical even though the assignment is not large.

ation is performed quicker for other important work, or attaining a greater degree of desirable or necessary accuracy. It is not unusual to run up costs on tools and fixtures for a single operation when the additional equipment will make it possible to machine the work to necessary closer limits.

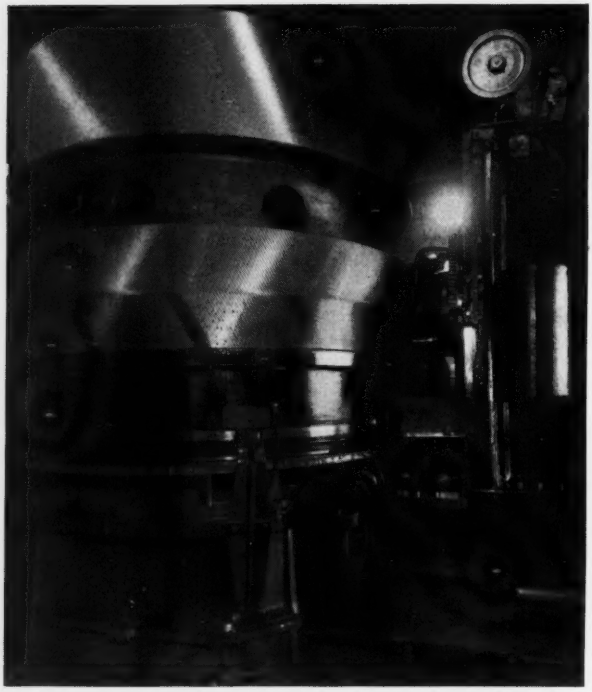

Fig. 11—Hobbing a helical reduction gear for a large steel ship. This gear is 10 ft. in diameter, and the hobbing operation takes 52 days. Speed, 2 rev. per hr.; feed, 0.078 inch.

As soon as the drawings for a job are received in the shop, the shop planners study the job and decide, in collaboration with the shop foreman, assistant foreman, and section quarterman, how and where the operations will be performed and what special tooling will be necessary. If the special tooling entails appreciable labor and material costs, or requires extensive design, the plant engineer is consulted and the designing is handled under his direction or in his office. In order that the work may be expedited and tools and fixtures made up in advance, where possible, close contact is maintained with the engineering department and in many cases the tools and fixtures are designed before the actual drawings for the work have been issued. Time is an important factor and all work passing through the shop carries detailed operation and time limit schedules.

The illustration Fig. 10 shows an excellent example of special tooling which is profitable for a comparatively small "lot" of parts. Here an Ingersoll planer-type miller is shown in operation, milling a special guide section from a forged slab. While a shipyard is essentially a huge job shop, with a minimum of repetitive work, yet the shop supervisors are ever on the alert to make use of special tooling whenever it can be justified. In this case a special clamp is used to align and hold the ends of the slab, and a special set of cutters is used to obtain the contour, width of slots, and depth. It does not take a very large lot of pieces to save the cost of the tools when the number of extra settings and cuts that would be required by using a

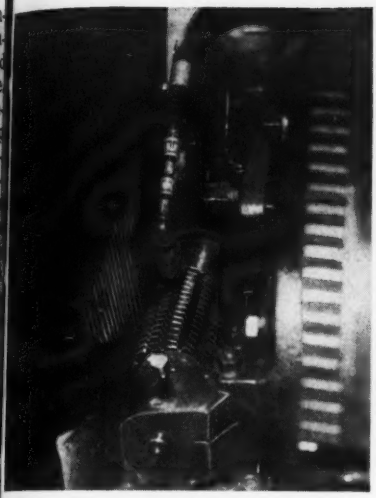

Fig. 12—Close view of the hob at work on the 10-ft. helical reduction gear.

single-point tool are considered.

The illustrations Figs. 11 and 12 are photographs of a gear hobbing machine taking a finishing cut on the helix of a helical reduction gear for a large steel ship. The reduction gearing of a ship functions somewhat the same as the transmission of an automobile, reducing the speed of the turbines down to the speed at which the propellor must rotate. Cutting these helical gears is one of the most important operations in a shipyard machine shop. The hobbing machines are built to the highest standards of accuracy and every care is exercised in setting up the job and cutting the gears to the closest limits possible.

The gears are turned in a large lathe on their own journals, in special bearings mounted in the lathe, rather than on centers. The gears are indicated with dial indicators and the readings are marked on the periphery before the blanks are removed from the lathe. Then the gear is set up on the hobbing machine table to within 0.00025 inch of these marked readings. The shims used in locating the gear on the table are made of 0.001 inch shim stock. The gear shown is 10 feet in diameter, with each helix about 26 inches wide. One

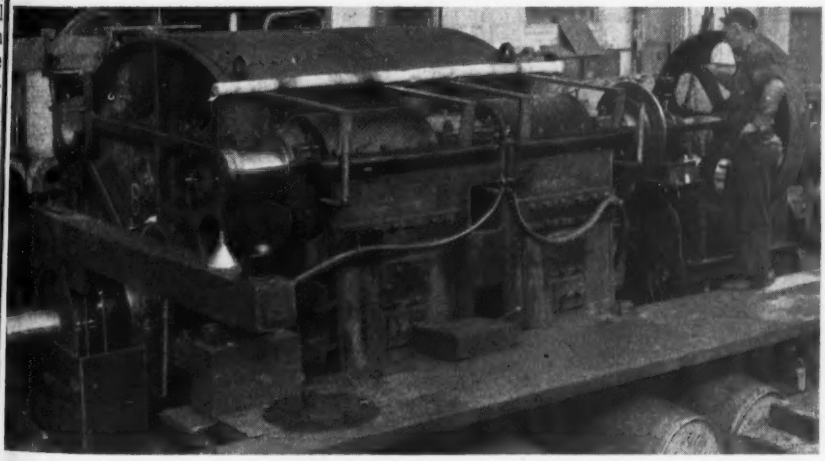

Fig. 13—After the reduction gears and pinions are cut, they are lapped in their own housings. The gear is lapped with a cast iron pinion, then the gear is used to lap the steel pinion with which it is to run in service.

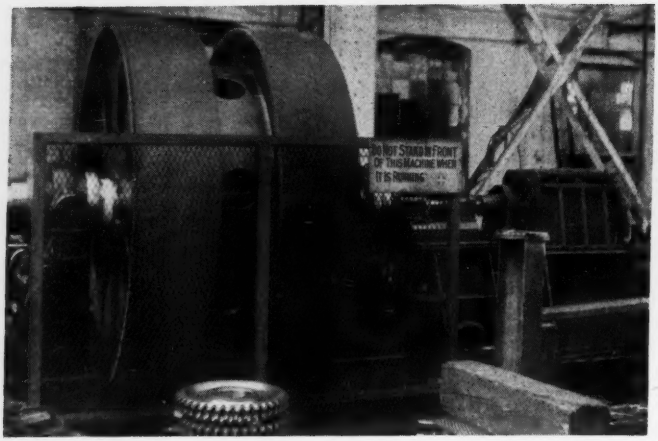

Fig. 14 — Balancing a large duplicate gear in a dynamic balancing machine. Any tendency to vibrate must be eliminated by careful balancing so that the gears will operate smoothly at high speeds.

roughing and one finishing cut are taken on each helix, the gear being turned over on the table after the first helix has been completed. A total of 52 days is required to cut the gear shown. Once a cut is started, the machine is run continuously, 24 hours a day and 7 days a week until it is finished. In case the current is interrupted due to an electrical storm or other uncontrollable cause, the operation is resumed as quickly as possible; if the machine is allowed to cool, the gear will be marked when the machine is started again and it will be necessary to recut the entire helix. A feed of 0.078 inch is used on the finishing cut, with the gear making two revolutions per hour.

After being cut, the reduction gear is lapped in its own housing as shown in the illustration Fig. 13. To obtain a duplicate of the actual operation of the gear, a cast iron lapping pinion is used with which the gear is operated, a grinding compound being used on the teeth of the lap and gear while they are running. What looks like a long white pole on the top front of the gear housing is really a roll of canvas which is normally rolled down over the gears to prevent the compound from being thrown by the centrifugal force.

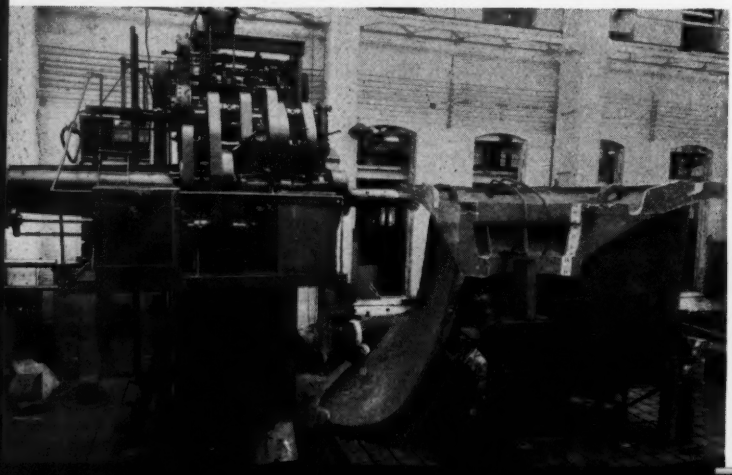

Fig. 15 — Thi... section of a ... draulic turbi... runner bei... faced at the joi... The size of ... mill and work ... be gauged fr... the size of ... machinist's h... standing on ... machine tab...

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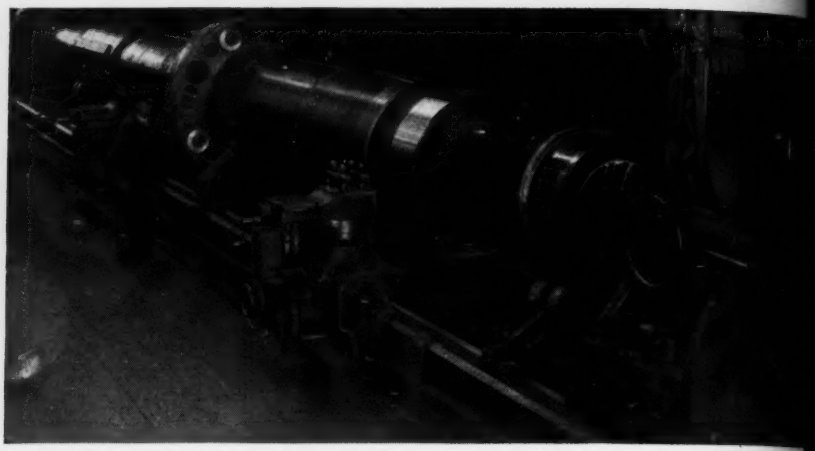

Fig. 16—Testing an assembled turbine shaft and generator shaft for alignment. This lath will swing 64 feet between centers.

The gears and pinions are mounted in their regular frame or gear housings, and are driven by a motor belted to the pulley at the end near which the operator is standing. Resistance is applied by means of the wood beam shown at the near end of the machine.

After the reduction gears have been cut and lapped, they are set up in the large dynamic balancing machine shown in the Fig. 14 and are dynamically balanced so that they can be operated at the high speeds for which they were designed without setting up any vibration. A one-half ounce weight attached to the gear at a point 4½ feet from the center will register on the indicator. The dynamic balancing machine is one of the most important pieces of equipment in the shop. Gears, pinions, turbine rotors, propellers, centrifugal pump runners, and practically all rotating parts in ship propelling machinery that attain any speed to speak of are balanced on this machine.

The two remaining illustrations in this article, while not parts used in shipbuilding, are interesting because of their unusual size and the manner of processing.

Fig. 15 shows a third section of a gigantic hydraulic turbine runner being milled at the joint-face, a 10-inch Sellers horizontal boring mill being used for the job. When completely assembled and finish-machined, this runner weighed 125 tons and operated in a turbine delivering 103,000 h.p. at maximum head. The runner was built in three sections in order to facilitate shipping and assembling in the field.

The turbine shaft for the runner described above is shown in Fig. 16 coupled with the generator shaft and being rotated in a large engine lathe in order to test the alignment of the two shafts. As can be seen from the photograph, there are four bolts in place in the coupling with several other temporary bolts to hold the coupling together. After testing and aligning the shafts, the remaining coupling bolt holes were reamed and the bolts fitted, thus insuring maintenance of alignment. This lathe will swing 64 feet between centers.

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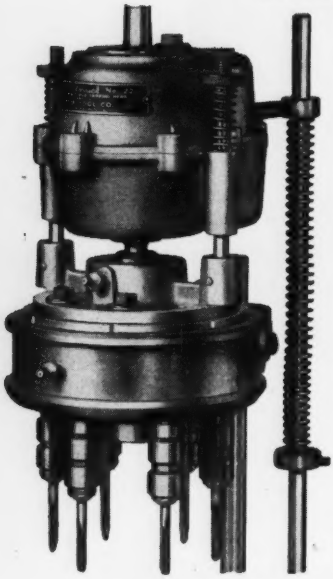

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Getting Results with Sintered Carbides

By Frank W. Curtis

Manager, Firthite Division, Firth-Sterling Steel Company

TO get the most out of any product merely requires a knowledge of how that product should be used and applied. Too often are basic rules overlooked, with the result that certain losses become inevitable. In other cases, basic rules are not investigated or clearly understood and again results do not attain satisfactory proportions. Whether it is attributable to lack of knowledge or carelessness, there seldom is an excuse for continued negligence, especially when information of a helpful nature is readily available.

There is much to be gained by observing certain simple, yet basic, principles regarding the application of sintered carbide tools. Some of these principles are explained in this article.

For example, to use a twist drill with insufficient or improper coolant on materials requiring wet operation, or to run it too fast or with too heavy a feed is nothing less than deliberate waste, because drilling is one subject upon which there is available practically everything needed in the way of instructions for correct application.

In the same light we have sintered carbide, which is made in both tungsten and tantalum types. Here is a product that offers the most outstanding possibilities in the form of economies if it is used as it should be used, yet any deviation from good sound practice is bound to result in some kind of loss, whether minor in nature or a total failure.

In covering a subject so broad as the use and application of sintered carbides, it might be well first to consider briefly what the material is and how it is made, because knowledge of these facts is, after all, basically important. Unlike tool steels, sintered carbides are made from extremely fine powders, mixed together, pressed in a mold to form a blank or tool of desired size, then sintered in a hydrogen furnace at a temperature above the melting point of the binder. This treatment unites these small particles solidly, making the blank inherently hard. From this process the name sintered carbides is derived.

The most common form is sintered tungsten carbide, which usually comprises more than 90 per cent pure tungsten carbide powder and the balance metallic cobalt powder as a binder. Such a mixture when sintered becomes unusually hard, extremely dense, and in a sense somewhat brit

The hardness ranks close to the mond, our hardest-known sub- nce. This description offers in a eral way what sintered carbide is what we should cater to—its dness, which is far greater than

The strength of sintered carbides has been increased tremendously in the past few years, particularly of late, and it is not necessary to handle a tipped tool like a delicate instrument. The tools will stand a certain

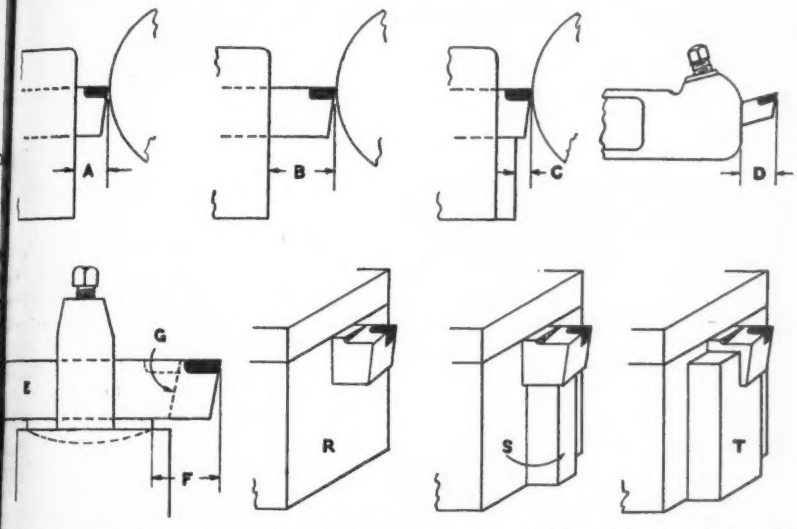

Fig. 1—Particular attention should be paid to overhang when applying sintered carbide tools.

at of high-speed steel, and a cer- in amount of brittleness which is haracteristic of any hard material.

One of the worst offenses when anging to the use of sintered car- ide tools is to follow traditional ractice, because the difference in the ture of the material naturally calls r some difference in its use. Appli- tion requirements, however, are no ore difficult. Seldom is any added ost involved if sound principles are pplied from the start. It is purely a se of catering to hardness, incor- rating at least as much strength nd rigidity as is needed (and more f convenient, as a margin of safety), eing sure that the tool is large nough and of correct proportions, nd paying attention to overhang.

amount of abuse and — generally speaking—will give a very good account of themselves under ordinary conditions, but with any product it pays to follow correct rules in order to get the utmost in results.

Sintered carbide tools, when applied to a broad variety of metal-cutting operations, quickly taught the necessity of rigidity not only for their own good but for the good of all kinds of metal-cutting tools. In view of this fact, it is obvious why the use of correct principles is emphasized so strongly in connection with sintered carbides. It is a case of getting started correctly and learning what should be done right at the beginning rather than to overlook sound practices and eventually

find it necessary to make alterations which in the meantime might have become more difficult.

One of the best-known qualities a sintered carbide is its ability to cut at higher speeds; speeds usually about three times those used for high-speed steel. The power required for metal cutting is taken at the cutting edge of a tool, so when the speed of cutting increases, the amount of power used also increases, and accordingly so should the size of the

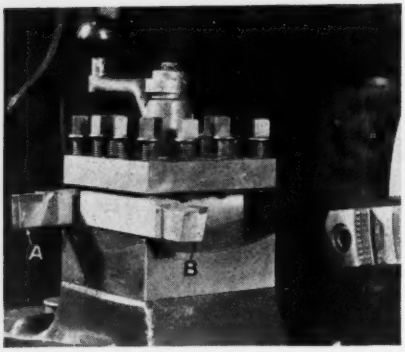

Fig. 2—An example of poorly mounted carbide tools that will deflect under load.

tool increase. Many plant executives have already realized this, but it is surprising how many there are who have not.

Here is an actual case representative of what a heavier tool will do. In facing a square flange, cast iron, removing ⅛ in. at a speed of 70 rpm, a high-speed steel tool measuring ½x1 in. was used with favorable results. In applying a carbide tool for the first time, a shank of equal size was used. The cutting speed was increased by steps to 200 ft. per min., but after two hours operation the carbide insert was damaged.

A few months later another trial was made on the theory that a heavier tool would improve conditions. Using a ⅝x1¼ in. tool helped t mendously and the tool stood about two days.

Unfortunately, however, the cu ting edge of the carbide had a ten ency to chip out — disappointing, say the least. The machine was the best for an intermittent cut b one improvement led the way for a other, so by acting upon the sam theory a much heavier tool was a plied, 1¼x2 in. in size, and the pro lem was solved. The tool stood t about two weeks between grin without the slightest signs of dam age.

Overhang is detrimental to sin ered carbide tools, therefore eve effort should be made to minimi the unsupported projection. A tool will deflect under load in propo tion to the amount of overhang, an the larger the overhang, the greate the deflection. Every overhangin tool has a certain amplitude of v bration which increases by the cub of the unsupported overhang. Thu a tool with twice as much projectio or overhang—assuming it is of th same size and operated with equa load—will have eight times as muc deflection because the cube of tw which is the difference in overhang equals eight (2x2x2x8).

This would be the case with th overhang shown at A and B in Fi 1, in which A=¾ in. and B=1½ i If the tool shown is ½x1 in. and pro jects 1½ in. as at B, but can be rese to reduce the overhang to ⅜ in., a at C, the difference in overhang rat would be 4 to 1. Applying the ru as mentioned, the cube would b 4x4x4=64, which means that the too with excessive overhang will deflec 64 times more than the tool with min imum overhang.

The efficiency of small toolbits very often reduced considerably b overhang. If used for light finishin

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cuts they prove satisfactory, but more often they are applied for semi-roughing or roughing cuts, and with an overhang as shown at D it is easy to visualize what happens. It would be far more economical in the long run to use a solid shank tool as illustrated at E, but even here special attention should be paid to overhang because a condition such as that indicated at F is likely to occur. The tool should be set in as close as possible, as shown by the dotted lines G, and results will be more favorable.

Toolblocks used for production setups can usually be improved, whether they are of the single- or multiple-tool type. The block at R, for example, is representative of the design commonly used in which the tool has a normal amount of overhang. The first step in the form of improvement would be to add the integral support S, which braces the end of the tool so that deflection is almost negligible. The next improvement would be to make the support as shown at T, which not only diminishes deflection downward but also overcomes side strains and offers the utmost in rigidity. It is the application of principles of this kind that will increase the efficiency of sintered carbide tools. Tests will quickly show that a tool supported as at T will usually last twice as long between grinds as one set as indicated at R, depen ing somewhat, of course, upon t nature of the cut.

In Fig. 2 may be seen a represen ative example of excessive tool ove hang. The two tools A and B a 1½ in. square, heavy enough f extra-heavy cutting, properly grou and of correct design, but they ove hang the toolblock at least 3 When in use and under load they w deflect repeated and repeate stress will final result in failu Yet sintered ca bide tools a used like th daily and sho executives wo der why resul fall short of e pectations.

Fig. 3—Excellent performance is attained by using a large tool, closely coupled, such as shown here.

Contrast the tools with th shown at A Fig. 3, which also 1½ inch square. This to is used for facin the large cas iron flange fa B. The cut is in termittent, ⅛-in deep, and is take at 250 ft. pe min. with excel lent results be cause the tool is well supported close to the cutting edge, reducing overhang to a minimum.

It would be unreasonable to assume that every sintered carbide tool in use today should be of standard proportions. There are certain conditions that alter tool design, one way or another, with the result that a wide variety of shapes and sizes of tools are needed and no doubt always will be.

There is a marked tendency, how-

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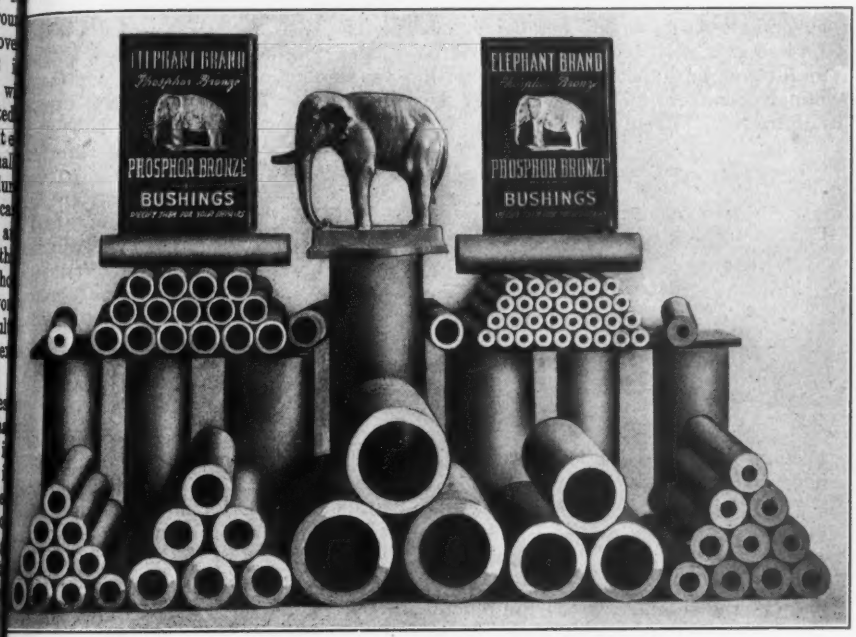

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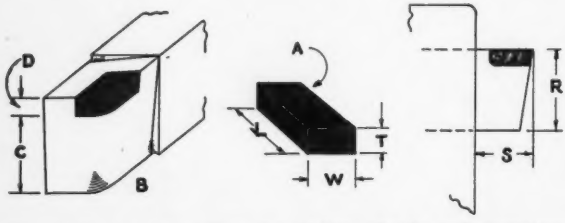

Fig. 4—Correct proportions for blanks, shanks and mounting of carbide tools is important.

better and satisfaction would be assured.

Considering only the so-called straight-type tool as used for turning, there are three important considerations; namely, (1) the blank or tip, (2) the shank, and (3) the mounting or method of application. If all of these three points are correct, there will be little cause for trouble. If they are disregarded, the utmost in results cannot be expected.

BLANKS. The ideal blank is one that is twice as wide as it is thick and twice as long as it is wide, such as $\frac{3}{16}$x$\frac{3}{8}$x$\frac{3}{4}$ in., or ¼x½x1 in., as shown at **A** in Fig. 4. Now then, it is necessary at times to deviate from these proportions, which can be done moderately without much danger, but there is a limit and that limit is important. A long, thin blank, say $\frac{3}{32}$x½x1½ in., is not particularly attractive from either the standpoint of manufacture or of use. It might warp during brazing or it might have inherent sintering strains, with the result that it would crack if put to severe use. Knowing this to be the case, the thing to do would be to correct the design right at the beginning.

The tip should be made thicker. This might necessitate a heavier shank and even require some change in the toolblock, but any expense involved in so doing will be more than repaid in the form of results. Tool cost will be less in the long run, and tool life will be increased considerably. Carbide tips obviously out of proportion should be avoided. There usually is a way out if the problem is thoroughly analyzed.

SHANKS. It is almost as bad to use too thin a shank as to use too thin a tip. There is a balanced proportion that can be termed ideal also. That would be a 4 to 1 ratio, as illustrated at **B**, the shank under the blank **C** being four times the thickness of the blank **D**, such as a ¼-in. blank and a 1 in. shank, making a total of 1¼ in. Here again such proportions cannot always be carried out, but the deviation should be as little as possible. On the other hand, it is surprising how often a slightly heavier tool could be used with but very slight changes to the toolblock . . . . a sort of inexpensive modification that would improve results beyond conception. Usually there is too much of a tendency to follow former practice, to copy something that has always been done, to take the easiest course and then wonder why results are not as expected. It is always well to remember that sintered carbide is harder, it requires the utmost

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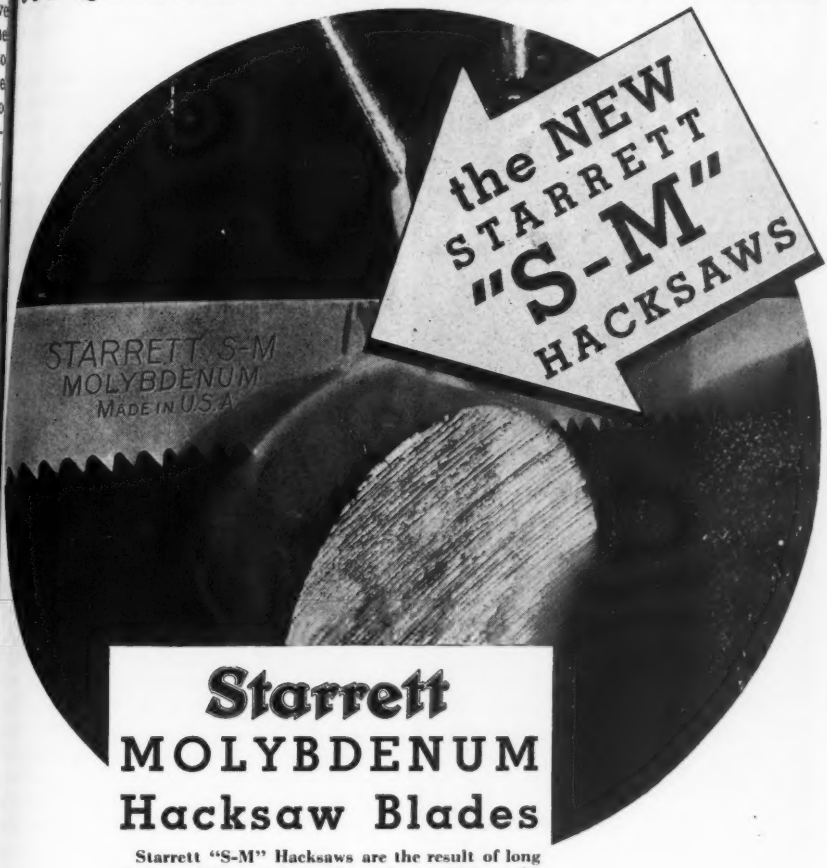

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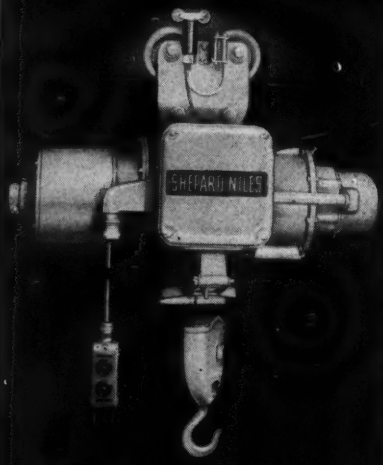

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in rigidity, and it should be applied with a knowledge of its characteristics in order to get the most out of it.

Now, if the shank and blank ratio cannot be made 4 to 1, every attempt should be made to carry out at least a 3 to 1 ratio. Less than this is on the borderline of danger because the blank does not receive enough support. Tools with questionable proportions can be made and may work with a certain measure of success, but unquestionably performance would be bettered if more body and more strength were added.

Another problem enters the picture when the shank is too thin. Let us assume a ½ in. thick tool, ⅝ in. wide, with a $\frac{3}{16}$ in. thick blank ¾ in. long. With such a tool there is a definite risk involved. During brazing, the shank might become distorted due to the high temperature, or it might warp at the end while cooling. The blank then would be under strain and might become cracked when being ground or when put to use.

It is also possible to loosen the firmness of the braze if such an action takes place while cooling. The blank is then without support at the very end, just where a solid bond is needed, with the result that a portion of the carbide blank is likely to break off after a certain amount of use. The consequence is a partial, if not total, loss of the tool.

Any rule usually works both ways, so consider the other extreme. Assume the ratio to be more than 4 to 1. The results will probably be some better because rigidity is important, therefore up to a certain ratio, depending on the nature of the cut to be taken, the heavier the shank the more favorable will be the performance.

MOUNTING.—A good tool is no better than its mounting, hence the mounting becomes the tying link that

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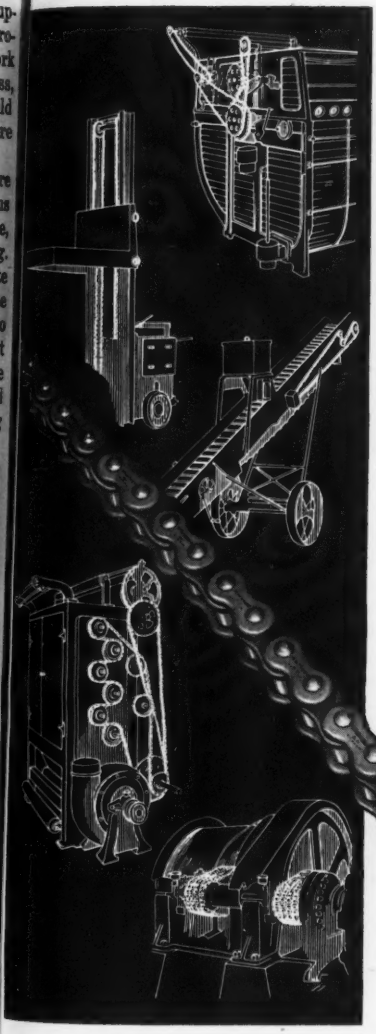

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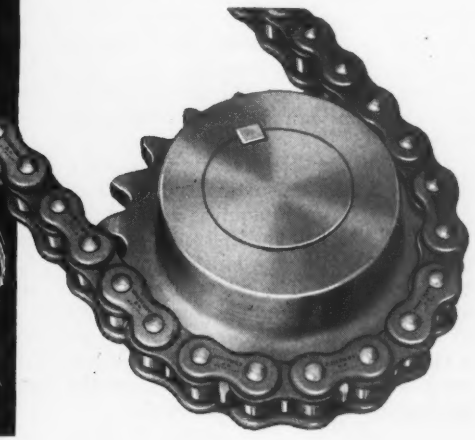

makes the correct tool work at its best. The support should be extremely solid and everything concerning the mounting should be rigid. Particular attention should be given to minimize overhang, as has been mentioned. Based on a ratio, the tool should at no time extend beyond its mounting — unsupported — for more than 75 per cent of its total height.

A 1 in. tool, as at R, for example, should not project more than ¾ in. as indicated at S. Here again a maximum is given, but it would be better wherever possible to reduce this amount to half or even less. While this is not always possible, it is surprising how many willful violations of this rule can be seen here and there.

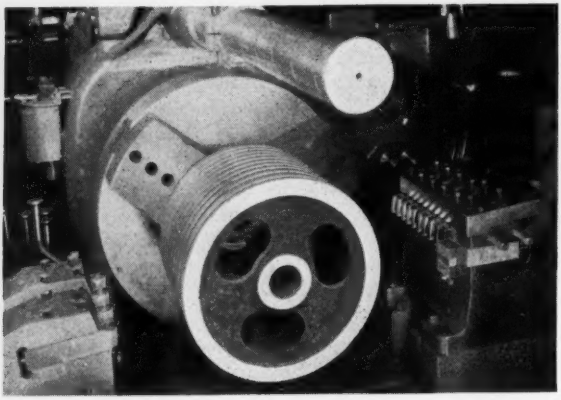

Fig. 5—A well-laid-out Firthite installation for turning and grinding a semi-steel drum.

With just a little thought, a very poor condition can often be corrected. Sometimes it only requires setting the tool into the toolblock; sometimes an extension to the toolblock is needed; but regardless of what is needed, the expense is usually less than the loss of a single tool. Reduce overhang to a minimum and you eliminate another condition that can seriously affect the performance of a carbide tool.

Now then, consider the three conditions referred to—the blank, the shank, and the mounting—and then combine the three into one. The result will be a most perfect application for a sintered carbide tool. Other factors are important, quite naturally, such as the nature of the cut, speed, feed and depth of cut, but these are outside strict tool design.

Here is a typical tool: The blank is $\frac{3}{16}$x⅜x¾ in., the shank (slightly over four times the thickness of the blank) is ⅝x1 in. and mounted with 1 in. overhang (less than the maximum of 75 per cent of shank height). A sintered carbide tool such as this will work invariably without a particle of trouble. Everything is as it should be—a good blank, husky shank and correct mounting. The same proportions apply for smaller or larger tools.

Many requests are made for carbide tools "to be exactly like high-speed steel sample." Such a notation indicates that no effort has been made to see if something better is available. It also indicates that the basic rules of carbide application have been entirely overlooked. It is easy to say "make as per sample" but it is at this stage that some ingenuity is needed—enough forethought to determine how added strength can be incorporated, whether or not some improvement is needed, or, for that matter, whether or not the design is basically as it should be. It is always well to remember that it pays to be modern and that modernization includes the application and use of proven methods.

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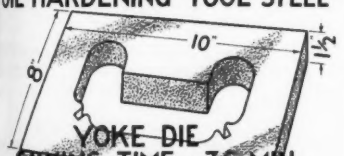

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using several turning and grooving tools is illustrated in Fig. 5. The part being machined is a semi-steel drum. Each tool is designed with correct proportions, and as will be seen, particular attention has been paid to overhang. This is evidenced by the turning tools shown at the left. In all, 85 lb. of metal is removed from this casting in 11 min., which is representative of the possibilities of sintered carbide when the tools are properly designed and used.

As a means of getting the most out of sintered carbides, a check-up should be made of whatever applications are in use. First, see if the tool proportions are correct for the blank and the shank, then check the overhang of the tool. Follow the rules given here and not only will results be improved but the application of sintered carbides will quickly find a broader use, even for operations that heretofore have been of a doubtful nature.

GRATON & KNIGHT PERFORMANCE BOOK. Performance facts are always interesting and give a prospect or customer something concrete on which to base future purchases. The Graton & Knight Company of Worcester, Massachusetts, manufacturers of Research Leather Belting, have recently sent to their distributors and salesmen a Performance Book that contains many interesting experiences from actual case studies.

In this book, you are able to see the actual results of the work that is being carried on at the "Home of Research". Typical of the studies contained in the book is the one in which a textile mill found that they obtained a bonus of $9.84 per drive belt per year from a 1% increase in speed made possible by a Research Belt. Another reports that on a Davis & Furber card, there was less than 0.6% stretch in a year's service. A lumber mill says that a Research Belt operated on a Head Rig for two seasons without cutting or maintenance. In a Food Plant the superintendent says that Research licked the worst drive in his plant. And so the book goes on—with definite and concrete evidence of the performance of Research Belts.

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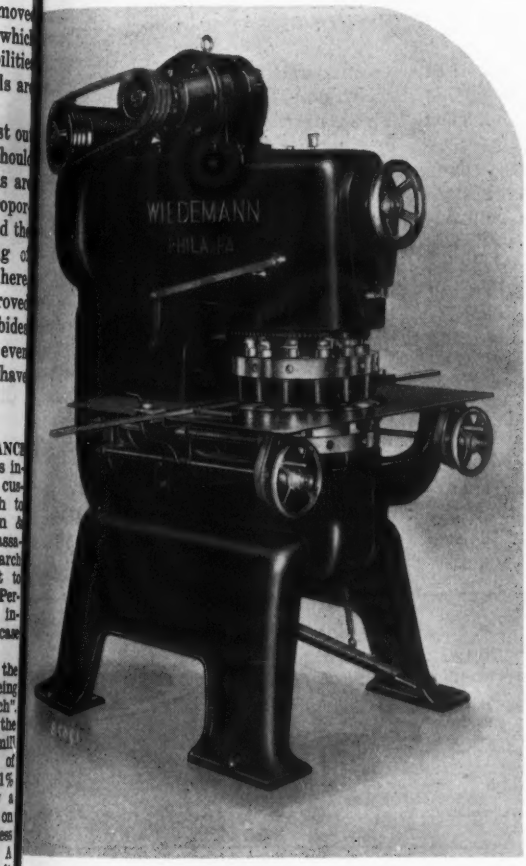

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Safe Capacities for Presses

And Their Relation to Shearing Strengths of Material

By C. W. Hinman

ACTUAL tests have shown that a constant pressure of 50,000 pounds, or 25 tons, must be exerted ¼ inch deep to shear through a cross section of mild steel bar 1 inch square when the bar is placed between flat-faced cutting members. The remaining ¾ inch breaks through and follows a line practically coincident to the relative positions of the shearing edges.

In large cutting off and blanking dies, the cutting members are provided, with angular shearing faces which reduces the shearing pressure by one-third for metals over ¼-inch thick and one-half for lesser thicknesses. The height of a face-shearing angle should be not less than the thickness of the work material, and the factor of safety against fracturing either the crankshaft or the press frame must not be exceeded.

Commercial crankshafts are usually forged from .45 carbon steel billets, and therefore possess high elastic limits. Steel alloys containing molybdenum or nickel are used for special crankshafts when high speeds and continuous operation are anticipated. This extra precaution provides against crankshaft fracture and wear and also provides a very high elastic limit.

The safe working capacity of an ordinary single crankshaft is determined by squaring the diameter of the shaft in inches, taken at its main bearings, and multiplying the result by 3½. This formula gives the safe capacity in tons. It should, however, be used only for crankshafts having main bearings of equal diameters and which are located on each side of a single crank.

For double-crank presses the shaft capacities are identical with those of the single-crank, up to about 10 inches shaft diameter, after which the double-crank capacities exceed the single-crank strength rapidly as the diameters increase. For example, for double-cranks 11 inches in diameter, we have a safe capacity of 650 tons; for 12 inches diameter, 1150 tons; for 14 inches, 1400 tons; for 15

Penetration Table

Table showing to what extent, in punching operations, mild steel must be penetrated by a flat-faced punch to effect complete severance of the blank

Thickness in inches	1	¾	⅝	½	⅜	5/16	¼
Per cent penetration	25	31	34	37	44	47	56
Thickness in inches			3/16	⅛	3/32	1/16	1/32
Per cent penetration			56	62	67	75	87

Standards

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Approved by American Standards Association, February, 1936. The data contained will be used by both the manufacturers and users of Socket Screws.

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inches, 1700 tons; for 16 inches, 2,000 tons; for 17 inches, 2,300 tons, and for 18 inches, 2,700 tons.

For safe crank capacities for presses of the type that is operated by a disc having an overhanging crankpin, square the diameter of the crankpin and multiply the result by 3, which will give the safe capacity in tons.

The following table of Ultimate Shearing Strengths of Materials in Tons is based upon the use of flat-faced cutting members. For a shearing cut, when the material does not exceed ¼ inch thick, one-half the tonnage given may be used, and for any thickness exceeding ¼ inch, tw thirds the table tonnage is use Multiplying the total cutting lengt or perimeter of the blank, in inche by the thickness of the blank in inche times the material tonnage giv herewith gives the tons pressure r quired for shearing with a flat punc and die.

Example: A blank of mild steel to be cut with a flat punch and di The blank is to be made from No. U. S. Gauge material 0.025 inch thic and has a total cut edge 12 inche long. How many tons blanking pre sure is required? Ans: 12 × 0.02 × 25 = 7½ tons.

Table of Ultimate Shearing Strengths of Materials in Tons for a Cross-Section 1 Inch Square

Aluminum, Cast	6
" Soft Sheet	7½
" Half Hard Sheet	9½
" Hard Sheet	12½
Asbestos Millboard	2
Brass, Cast	18
" Soft Sheet	15
" Half Hard Sheet	17½
" Hard Sheet	20
Bronze, Gun Metal	16
" Phosphor	20
Copper, Cast	12½
" Rolled	14
Cupronickel	20
Duralumin, Soft Sheet	15
" Treated	17½
" Cold Rolled	20
Fibre, Hard	12
German Silver Sheet, Half Hard	16
Iron, Cast	12½
" 2% Nickel	25
" Wrought	20
Lead	2
Leather, Chrome or Oak	3½
" Rawhide	6½
Monel Metal, Cast	30
" " Rolled Sheet	32½
Nicro Copper	15
Paper, (using hollow die)	1½
" (using flat punch)	3½
" Bristol (using flat punch)	2½
" Straw Board (using flat punch)	1½
Silver	15
Steel, Casting	30
" Boiler Plate	30
" Cold Drawn Rod	29
" Drill Rod	40
" Nickel, approx. 3½%	35
" Silicon	32½
" Stainless	35
" .10 Carbon Soft	22½
" .25 " Mild	25
" .50 "	35
" .75 "	40
" 1.00 "	42½
" 1.20 "	42½
" 1.20 " (Tempered)	95
" Hot, ¼ strength of cold	
Tin, Cast	3
" Rolled Sheet	2½
Zinc, Sand Cast	7
" Die Cast	8
" Rolled Sheet	9

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Portable Steel Bins of Uniform Design Facilitate Storage of Small Parts

By P. W. Fischer

H. G. Fischer & Co., Chicago, Ill.

THE manufacture of X-ray apparatus involves the use of a multitude of small parts, many of which are made from expensive materials. In a plant where such parts are used in large quantities, such as the plant of H. G. Fischer & Co., Inc., Chicago, Ill., the loss due to careless handlin and inefficient storage could run in a very substantial sum of money i a comparatively short space of tim

The possibility of such loss ha practically been eliminated in th plant, however, by the use of met bins of uniform size and desig made so that they can either b used as individual receptacle and handled as such, or they ca be stacked in tiers to form com plete sections of any length an height desired. These bins ar the "Stackbins" manufacture by the Stackbin Corporation Providence, R. I.

Fig. 1—Storeroom Section at H. G. Fischer Plant Built Up of Stackbins

The need for loss-proof bin of a design that would affor some flexibility for the handlin and storage of the smaller an more costly parts led this firm to experiment with Stackbins and enough were procured, sev eral years ago, to complete on section six bins wide. Since th first bins were installed, prac tically all the older types of bin have been replaced with Stack bins, built up in sections a shown in the illustration Fig. 1 This section is 17 bins high an some of the other sections ar higher.

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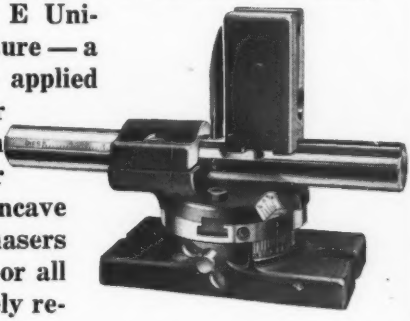

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size; some are six inches wide a
others are nine inches wide; the s
used depending upon the type a
size of the parts that are to be stor
All bins in one section are identic
however. The bins are neat so far
appearance goes, of compact desi

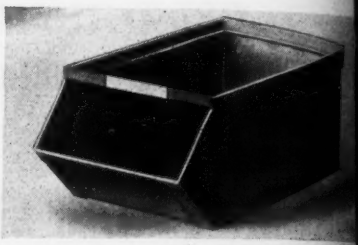

Fig. 2—The handy size and clean-cut de
of the Stackbin makes it an excellent c
tainer for use on the bench.

and are completely free from t
broken edges and splinters whi
characterize the usual wood bins.

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rebuilt in an hour or so by the stor
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penters or other mechanics. In erec
ing a section, the bins can be assem
bled so that an entire row of two t
six bins, depending upon the size o
the section, can be moved as one uni
and it is not difficult at all for tw
men to lift and carry three section
comprising 18 bins, at one time. Th
bins are moved with the stock i
them; thus it is not necessary t
scrape parts out of the bins, mov
them in separate containers, and the
put them back into the bins again.

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are placed on a hand truck of th
type shown in Fig. 3. Upon reachin
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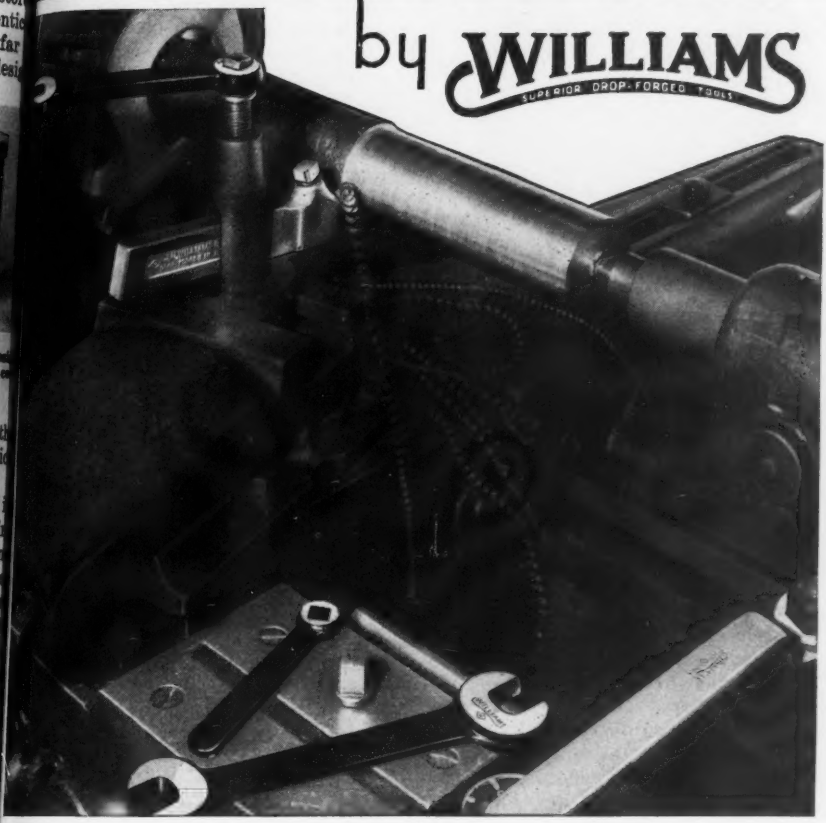

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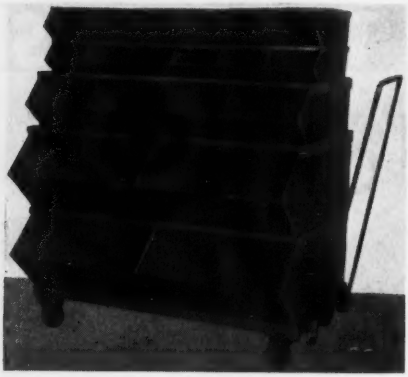


Fig. 3—Stackbins provide an economical and convenient method of handling small parts.

characteristic of metal construction is another desirable feature of the Stackbins. Wood bins and sections require a surplus of material in the form of supports and beams in order to obtain the necessary stability; the steel bins can be stacked in sections without the aid of extra supports other than strips with which sections of six bins are fastened together in a group.

Convenience is another desirable feature. Although the Stackbins are so designed that the parts cannot fall out, it is an easy matter to see into a bin and a man can get his hand into any Stackbin—even the smaller ones—without any difficulty whatever.

In this plant a double check is maintained on all parts in stock. When new parts are placed in stock in one of the bins, this fact is recorded on a file card of the type illustrated in Fig. 4. The card shows the part number and name of the piece, source of supply, number used in a unit, number required for reserve in order to insure an adequate supply of stock at all times, quantity and date ordered, quantity and date received, and location of the bin in which the parts are stored.

As the parts are placed in or withdrawn from stock, the amount of each such addition or withdrawal is noted on the slip indicated in Fig. 5, and this slip is placed in the file with the card shown in Fig. 4. Thus the card and slip provide all the information that may be required regarding receipts and disbursements and, in effect, comprise a perpetual inventory.

Entries on the cards and slips are made by a clerk whose desk is located in the stockroom, and inasmuch as all requisitions or receiving slips are turned over to him immediately upon receipt, it is a simple matter to keep an accurate record of all stock. After entering upon the cards and slips, the receiving slips and requisitions are forwarded to the accounting department for distribution of costs in the usual manner, and thence to the pro-

Part No. 2241 Location 30-G

Description DS-20 Short Wave 9-Pt. Switch Base

Order From Outside Reserve 100 No. used 2

Order only when group is wanted X Order parts first

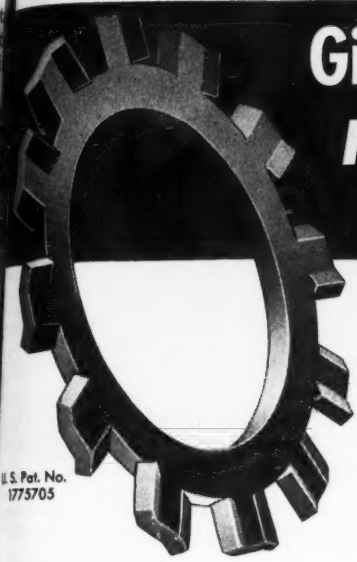
Order with Finish

Date Ordered	Quantity	Order No.	Date Rec'd	Quantity	Remarks
3-26	120	H-1139	3-28	123	
5-9	100	H-1215	5-12	100	

Form 1498

Fig. 4—Stock Record Card

Give Your Product *REAL* PROTECTION against VIBRATION



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The Camera Demonstrates Everlock Positive Locking and Powerful Spring Tension

End view of Everlock tongue before nut is set down. Note that body of tongue is horizontal with only sharp projecting edges touching nut and work surfaces. (Unretouched)

With nut set down. Note how body of tongue is flexed, setting up tremendous spring tension, and that the sharp projecting edges are forced into nut and work. (Unretouched)

Thompson-Bremer & Co.
1640-H W. Austin Ave. - - Chicago, Ill.

Everlock
The Dual Action
LOCK WASHER

TO STOCK			FROM STOCK			FORM H25
SHORTG. REPORT DATE	DATE RECD.	AMT. RECD.	DATE	ORDER NO.	AMT.	BAL.

Fig. 5—All stock receipts and withdrawals are entered on slips like this one, maintaining a perpetual inventory.

duction record department.

The combination of portable steel Stackbins and simple records comprise a stock-handling system that cannot be surpassed for simplicity, convenience, and efficiency.

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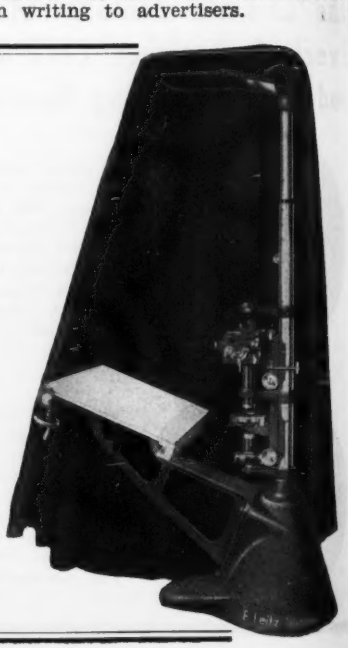

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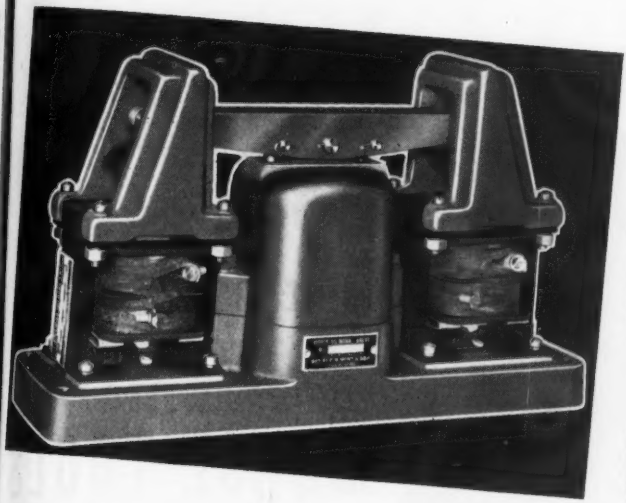

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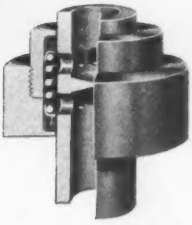

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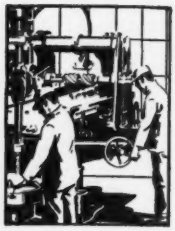

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Methods Engineering Procedure: Plant Layout and Machine Coupling

By H. B. Maynard

President, Methods Engineering Council, Inc., Pittsburgh, Pa.

Seventh Article of Series—Uses of Flow Process Chart—Development of Modern System of Plant Layout—Elimination of Waste Through Machine Coupling

PROPER plant layout, or the arrangement of machines and other equipment in the best locations for economical manufacturing, plays an important part in efficient plant operation. This fact has long been recognized by progressive manufacturers. Larger industrial units have found it profitable to set up special departments whose functions are confined to the study of products and processes for the sole purpose of improving manufacturing layouts. Many smaller plans also recognize the importance of good layouts, and from time to time their equipment arrangements are reviewed with a view to improvement.

Although attention has been given to the subject of plant layout for a number of years, ideas in connection with what constitutes efficient arrangement have recently undergone radical changes, due largely to the viewpoint developed by methods engineers as a result of their detailed methods studies.

In the very early days of modern industry, little attention was paid to economical layout. Machines were arranged in rows to facilitate the use of line drives, and benches and miscellaneous pieces of equipment were crowded in wherever there was room, with the result that the general appearance was usually chaotic. The movements of the operators were often hampered by the poor arrangement of the equipment and piles of finished and unfinished material. Material in process travelled back and forth between operations in a more or less haphazard manner, resulting in a considerable amount of lost motion.

With the introduction of interchangeable parts manufacture on a large scale, due principally to the development of the automobile industry, the more progressive manufacturers began to recognize the necessity for systematic planning and arrangement. As a result, the production machines were grouped into departments, each department usually consisting of all machines of one type or kind. The general appearance of the manufacturing departments was more pleasing, and a sense of orderliness was attained.

Experience in methods engineering, however, has shown that such arrangements are far from satisfactory and that many inefficiencies exist.

FLOW CHART

INTERNAL COMBUSTION ENGINE CYLINDER HEAD

Drawing No. 128305-A

Distance Moved in Feet	Time Dec. Hours		
		△	CASTG'S REC'D FROM STEEL FDRY 15 DAYS AFTER PLCN'G ORD'R
22	.1	0-1	UNL'D FRM SUP'L'RS TRUCK BY REC'VING CL'RK AND LABORER
	16.0	TS	STORAGE UNTIL ORDERED BY MACHINE SHOP
5	.05	0-2	LOAD ON TO TRAILER
	1.5	TS	STORAGE—WAITING FOR TRACTOR TRANSPORTATION
	.03	0-3	HOOK TRAILER TO TRACTOR TRAIN
225	.38	T	MOVE TO GROUP No. 1 DEPARTMENT 10
	.03	0-4	UNHOOK TRAILER FROM TRACTOR TRAIN
5	.05	0-5	UNLOAD TRAILER
	4.0	TS	STORAGE—WAITING FOR LAYOUT
	1.23x10=12.3	0-6	LAYOUT CASTING FOR MACHINING
	.5	TS	STORAGE—WAITING FOR MOVE MAN
15	.1	T	MOVE TO GROUP No. 4 DEPARTMENT 10
	4.0	TS	STORAGE WAITING FOR PLANER
	.453x10=6.53	0-7	ROUGH FACE—PLANER
	.5	TS	STORAGE—WAITING FOR MOVE MAN
16	.1	T	MOVE TO GROUP No. 2 DEPARTMENT 10
	4.0	TS	STORAGE—WAITING FOR MILLING
	.804x10=8.04	0-8	ROUGH MILL—2 OPERATIONS
	.5	TS	STORAGE—WAITING FOR MOVE MAN
5	.05	0-9	LOAD ON TO TRAILER
	1.5	TS	STORAGE—WAITING FOR TRACTOR TRANSPORTATION
	.03	0-10	HOOK TRAILER TO TRACTOR TRAIN
168	.45	T	MOVE TO ANNEALING FURNACE DEPARTMENT 22
	10.0	TS	STORAGE—WAITING FOR ANNEALING
10	.2	0-11	LOAD INTO FURNACE
	8.0	0-12	ANNEAL
30	.4	T	MOVE FRM FURNACE TO SAND BLAST BY SAND BLAST OPR'TR

Cont'd on Col. 2

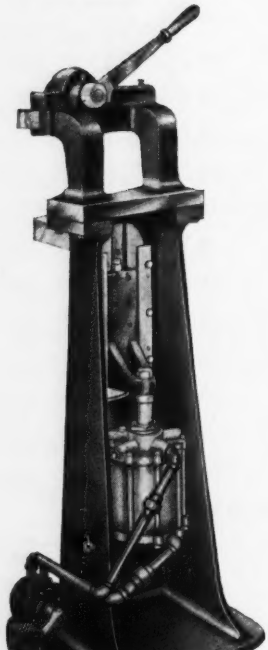
Distance Moved in Feet	Time Dec. Hours		
	.1x10= 1.0	0-13	CLEAN BY SAND BLASTING
5	.05	0-14	LOAD ON TO TRAILER BY SAND BLAST OPERATOR
	1.5	TS	STORAGE—WAITING FOR TRACTOR TRANSPORTATION
	.03	0-15	HOOK TRAILER TO TRACTOR TRAIN
398	.48	T	MOVE TO GROUP No. 4 DEPARTMENT 10
	.03	0-16	UNHOOK TRAILER FROM TRACTOR TRAIN
5	.05	0-17	UNLOAD TRAILER
	4.0	TS	STORAGE—WAITING FOR PLANER
	.412x10=4.12	0-18	FINISH FACE—PLANER
	.5	TS	STORAGE—WAITING FOR MOVE MAN
16	.1	T	MOVE TO GROUP No. 2 DEPARTMENT 10
	4.0	TS	STORAGE—WAITING FOR MILLING
	1.025x10=10.25	0-19	FINISH MILL—2 OPERATIONS
	.5	TS	STORAGE—WAITING FOR MOVE MAN
36	.1	T	MOVE TO GROUP No. 3 DEPARTMENT 10
	4.0	TS	STORAGE—WAITING FOR DRILLING
	.484x10=4.84	0-20	DRILL
	.5	TS	STORAGE—WAITING FOR MOVE MAN
28	.10	T	MOVE TO INSPECTOR
	2.0	TS	STORAGE—WAITING FOR INSPECTOR
	.1x10=1.0	INS. 1	INSPECT CYLINDER HEAD
	.5	TS	STORAGE—WAITING FOR MOVE MAN
5	.05	0-21	LOAD ON TO TRAILER
	1.5	TS	STORAGE—WAITING FOR TRACTOR TRANSPORTATION
	.03	0-22	HOOK TRAILER TO TRACTOR TRAIN
450	.75	T	MOVE TO ASSEMBLY DEPARTMENT 12
	.03	0-23	UNHOOK TRAILER FROM TRACTOR TRAIN
25	.11	0-24	UNLOAD TRAILER AT STOREROOM
	Indeterminate	TS	STORAGE—AWAITING ASSEMBLY

Con't. From Col. 1

Fig. 1—Flow Type Process Chart

MARKING

FLAT—ROUND IRREGULAR SURFACES BY ROLLING OPERATION



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Materials travel farther than necessary; too much valuable floor space is used for storage purposes; there is a great deal of back and cross travel of materials; the "coupling" of machines is impossible, and there is too much moving and handling of material. The evolution of manufacturing methods during the past 25 years has fostered the development of certain principles of plant arrangement which have come to be regarded as basic in scientific management. The most important of these are as follows:

1. Raw materials should enter at one end of the shop and the finished product should emerge at the other.
2. Aisles should be provided for plant traffic and should be kept clear at all times.
3. Machines should be arranged so that when a work-piece is laid aside at the completion of an operation, it should be placed in the position at which it may be picked up for the following operation.
4. No operator should be required to take more than one step to obtain or lay aside a work-piece.
5. Time spent by a machine taking a cut under power feed is idle time so far as the operator is concerned.

These principles have a profound influence upon plant layout. When applied, they usually result in layouts which look chaotic to the uninformed observer. They are anything but inefficient, however, as can be recognized from the fact that there are no piles of material standing about, that there is very little material-handling as a separate activity, and that one operator is often found operating more than one machine.

Methods of Making Efficient Plant Layouts

The first step in making a study of any plant layout is to analyze the processes and operations involved in

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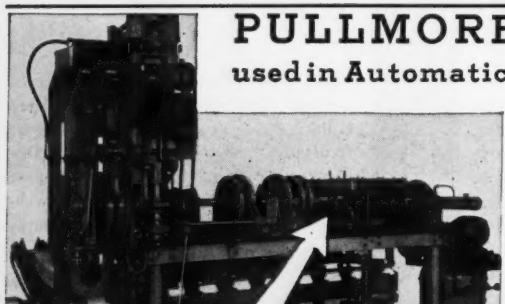
the manufacture of the product. Then the existing layout can be considered in order to ascertain the amount of moving of equipment required. Process charts are of great aid in this connection. A process chart, briefly, is a graphic presentation of information connected with a manufacturing process. Process charts are prepared in several different forms depending upon the job under consideration and the information which it is desired to show.

For layout purposes, the flow process chart illustrated by Fig. 1 is usually the most satisfactory type. On it are shown each operation performed during the entire process including all inspections, each transportation of material with distance moved, the time spent by material in temporary storage awaiting an operation or a transportation, and the length of time consumed by each operation or transportation.

A process chart reveals any major inefficiencies at a glance, and since it shows clearly and in detail all facts connected with the job under consideration, it forms the basis for the revised layout.

The next step is to consider the various arrangements of equipment which can be made. A floor plan of the available manufacturing space is first prepared to scale. The present location of all equipment can be shown on this plan, and the present flow of material can be indicated by lines drawn between machines and equipment to show the path followed by material. Templates to scale made of cardboard or heavy paper are prepared for each piece of equipment. These can be shifted about on the floor plan easily and quickly as various arrangements are considered.

The study of a layout is usually more than a one man job. One man can prepare the floor plan and tem-



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SOUTH BEND *Precision* LATHES

plates and make an initial tentative arrangement, but this should then be subjected to detailed criticism by the plant superintendent, the foreman in charge of the work, and any other interested individuals. During the inevitable shifting about, the templates may be held in place with thumb tacks. If desired, tacks with different colored heads may be used to represent different classes of equipment.

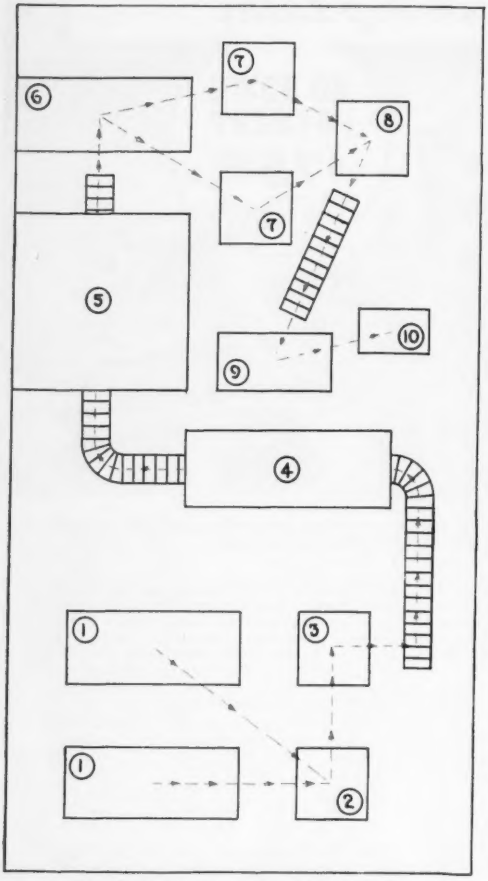
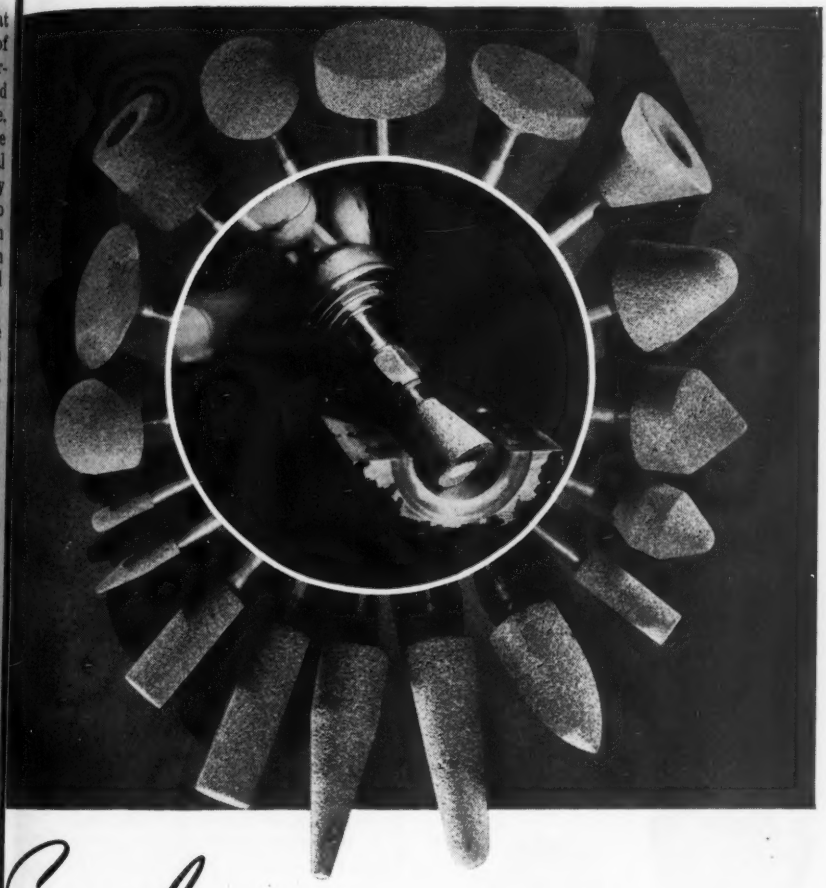


Fig. 2—Simple layout plan with colored thread used to indicate flow of material through plant.

When an arrangement is arrived at which seems satisfactory, the flow of material should be indicated to ascertain whether or not the moves called for are as short as possible. Since the layout at this stage is subject to revision, material flow may best be indicated by threads running from tack to tack on the layout. When changes are made it is then easy to change the material flow lines.

If a single product is to be made, the layout problem is simplified and the three principles enumerated above can be adhered to closely. If a variety of products are to be manufactured, the layout becomes more difficult. In this case it is usually best to take the most active job or class of work and make the layout which is best suited to it. Then other jobs should be studied to see how they will move through this layout. When the material flow is indicated, different colored threads may be used to show different products. Fig. 2 shows a layout representation of this sort at the initial stages of the study.

It has been said that when material is released at the end of one operation, it should be placed in the position at which it may best be picked up at the next operation. This means that instead of like machines, the machines used for producing a given product must be grouped. An engine lathe, a drill press, and a milling machine, for example, may be required for producing a certain part. These machines should be so placed that the engine lathe operator is able to release his finished piece in such a position that the drill press operator can conveniently pick it up, and so on.



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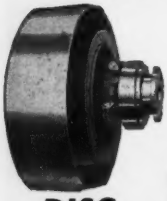

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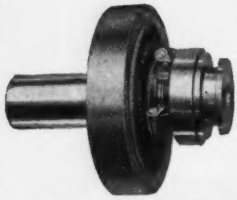

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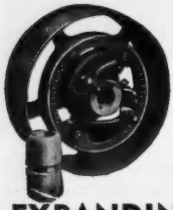

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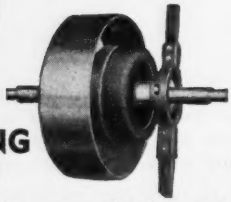

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In conformance with the fourth principle, no operator should be required to take more than one step to obtain or to release material. Very often it is impossible to place machines so closely together that this principle can be met, and it then becomes necessary to install some sort of conveyor. Often a short straight roller type gravity conveyor is suitable for transporting material between two machines. The high end is located in a convenient "release" position at the first machine, and the lower end is located at the "pick up" position for the second machine. Theoretically the time required to perform all operations should be the same so that as one operator lays down a part at the end of his operation, another part comes sliding up to him from the previous operation. When sufficient study is given to the process, it is often possible to approximate this condition remarkably closely.

Machine Coupling

When the time spent by a machine in making a cut under power feed is considered as idle time as far as the operator is concerned, it at once becomes evident that the operator should be provided with other work if study shows that the idle period is not necessary as a rest period for overcoming the effects of fatigue. Similarly, the time spent by the operator loading and unloading the machine is idle time as far as the machine is concerned. If the machine is large and expensive and has a high costing rate, idle machine time may be very expensive.

The ideal, of course, is to have both man and machine working continuously. In some cases this is accomplished by having the operator run a second, or even a third machine while his first machine is making a cut. This is known as "machine coupling." In other cases, this is not

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practicable. The possibility should then be considered of providing other work, so that the operator can use at least a portion of his idle time for removing burrs, chipping, and filing from castings fins and rough spots which must be removed in preparation for applying finishes or performing operations of a similar nature.

Possibilities for machine coupling can best be ascertained by preparing what are known as man and machine process charts. These charts show the relation of man time to machine time and permit the devising of arrangements which would be difficult to visualize mentally. For example, a certain bracket is to be machined on an automatic turret lathe. Time study shows that it requires .0231 hours to load and unload the machine, and .1990 hours to make the cuts. After the machine is loaded, the operation is entirely under the control of the machine, and the operator has nothing to do. The problem is to make a set up which will permit him to utilize the .1990 hour of idle time effectively.

Many different arrangements will probably be possible, but for a given set of conditions there is usually one which is better than the others. For the bracket job, there are three automatic lathes available. If these machines are all set up for bracket machining, the operator can run all three at one time. Even with this arrangement, however, a preliminary man and machine chart will show him to be idle .1528 hour for each three brackets machined.

The next operation performed on the brackets is a drill press operation on which an allowance of .0535 hour is established. There is no power feed drilling on this operation, so the operator can not do anything else while drilling.

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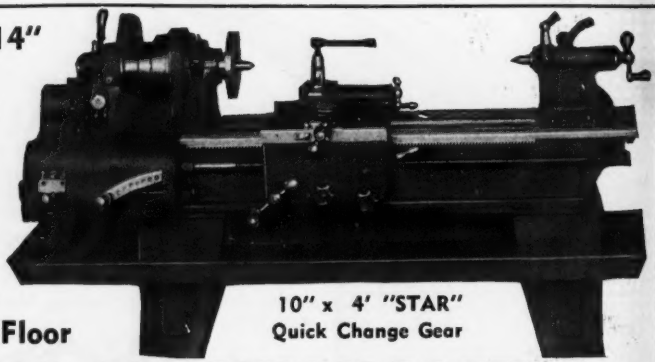

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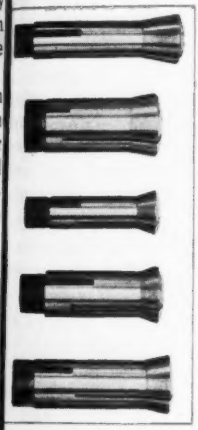

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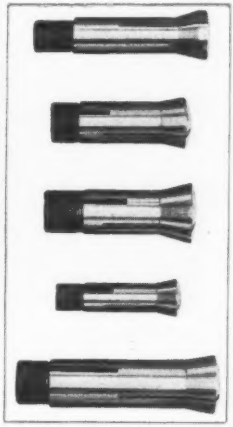

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the drill press to run. If he drills two brackets to every three machined on the lathes, he will be idle .1528—(2 x .0535) = .0458 hour per three brackets. If he drills three brackets to every three machined on the lathes, each lathe will theoretically be idle .0026 hour per bracket. The drill press time value is the allowed time, however. By exerting better than average effort and by developing better than average skill, the operator w better this time and hence will able to eliminate all idle time fro the cycle.

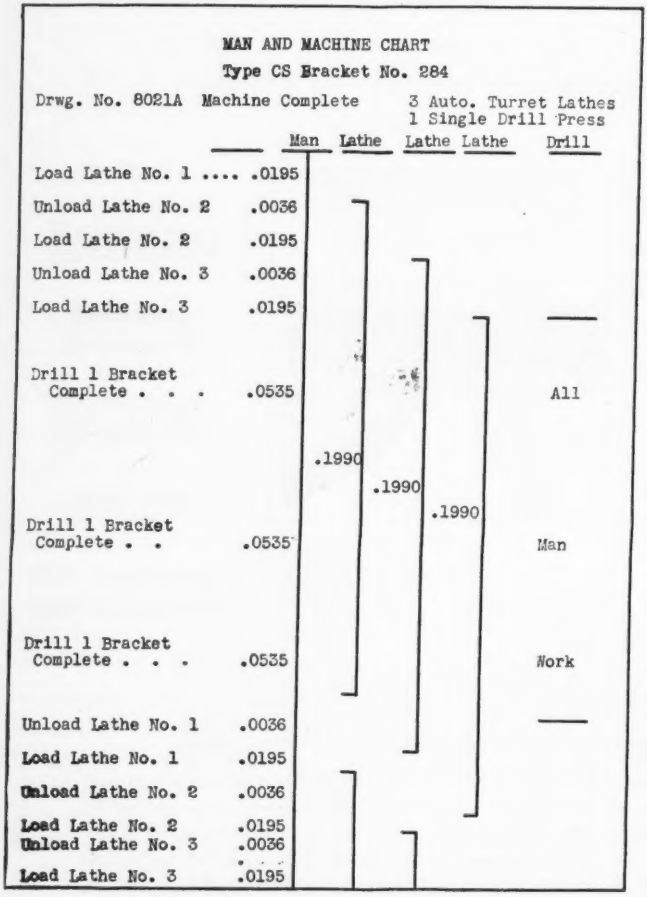

Fig. 3—Man-and-Machine Process Chart

The most ef cient arrang ment in this cas therefore, will for one man run three lath and one dri press, machinin three bracke per cycle. T man and machi process cha Fig. 3, shows t sequence in whi the operation must be pe formed to wo most effectivel

When work of a miscellan ous nature, m chine coupling more difficult a though not i possible. If su plus machin equipment available tw machines such two milling m chines may b placed facin each other. Whe the operator h a job requiring long cut on o machine, he ca set up and run short job on t other machine.

Where machine coupling has nev before been practiced, a certai amount of preparatory work must b done to overcome prejudices whic are quite likely to exist. Where f years it has been the custom to ha one man at each machine, operator

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It's safe because each valve lever automatically returns to neutral and, in the case of standard models, both ends of the cylinder are open to the atmosphere. No unsuspected build-up of air pressure in the cylinder is possible.

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power in his plant or builds equipment on which his customers will use air power. Write for a copy, to Ross Operating Valve Co., 6488 Epworth Blvd., Detroit, Michigan.

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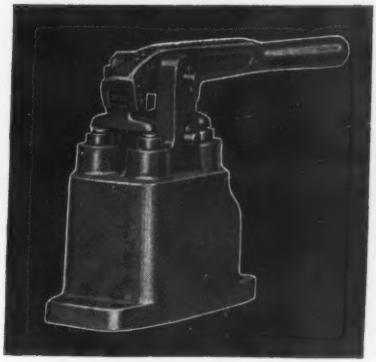

"—no lapping, no grinding"

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The efficiency of air power is governed by the valve controlling the air cylinder. In Detroit they make a valve that is unlike any other—a valve that restrains the giant in the cylinder, releases it in an instant—a valve that may be operated by hand, foot or solenoid.

It's the Ross Operating Valve. It's a superior valve because:

Of the poppet type, its action is more rapid.

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Quickly renewable poppet seats require no grinding or lapping.

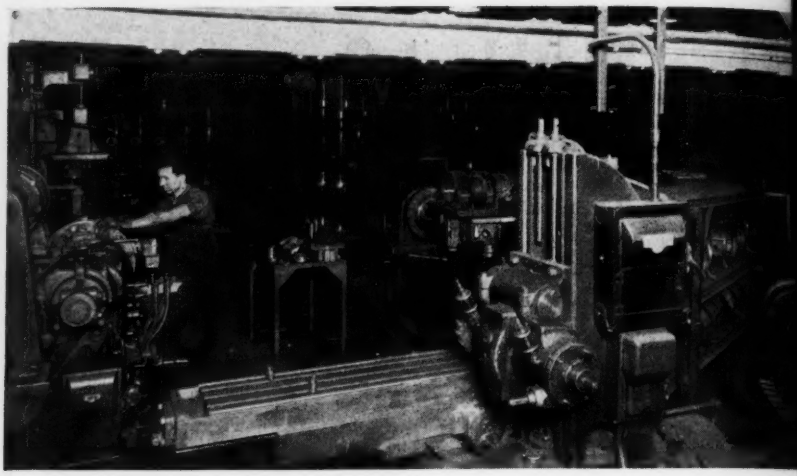

Fig. 4—Typical Machine Set-Up, Making Use of Principles of Machine Coupling

may feel that they are being asked to exert themselves unreasonably if they are asked to work in a period when they would otherwise be idle.

There is little logic in this attitude. Other operators such as assemblers, welders, molders, fitters, and so on, work steadily all day as a matter of course. Outside of occasional necessary breathing spells if the work is heavy, they do not expect to be idle. There is no reason other than habit that machine operators should expect different rules to apply to them. As a matter of fact, on automatic screw machine work and certain special purpose machines, it has been customary for one operator to tend several machines for many years. It is only when the principles of machine coupling are extended to lathes, boring mills, milling machines—machines on which the idea of machine coupling is new—that questions are raised. If this is likely to occur, however, the matter should be fully discussed with all concerned before the installation is made.

It should be made clear that machine coupling is not a speeding-process. The operator is not ask to work more quickly and to ru about from machine to machine, b rather only to occupy himself durin a period when he otherwise woul have nothing to do. In no case is h asked to exert an effort which is i any way detrimental to his ow safety or physical well being, sinc aside from humanitarian consider tions, this is known to be wasteful i the long run. When operators b come accustomed to the idea of han dling more than one machine, the usually have no objection to doing s since no intelligent individual find sitting or standing by a machine i enforced idleness a particularly inter esting task. Rather it is more inter esting to try to keep several opera tions going simultaneously, getting the best performance from each.

Quality is not impaired by this ar rangement since nothing that the man does after the cut is started in any way affects quality. The only precaution which should be taken is to make sure that the machine will not do any

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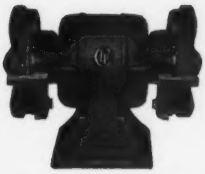

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damage if the operator is forced to be away from it longer than the time required to make the cut. Most modern machines can be set to stop automatically at any desired point.

Operators who run more than one machine customarily receive a somewhat higher rate of pay than operators who run only one, the thought being that they have greater responsibility and hence are entitled to higher compensation. On miscellaneous work where the running of two or more jobs at one time is left to the operator, he is usually paid the full amount for each job under the piece work or bonus plan used. Since the combining of jobs is left to the initiative of the individual, it is felt that he is entitled to the extra earnings, the employer being satisfied with increased production at the same overhead cost.

A typical production set-up making use of the principles of machine coupling is illustrated by Fig. 4. Two different types of electric motor frames are handled simultaneously in this set-up, and one man runs all machines. The frames are delivered by the double deck roller conveyor on the right to the milling machine in the foreground where the feet are milled. From the milling machine, one type goes to the automatic lathe on the right and the other to the lathe on the left, where they are bored and faced complete.

The frames are then placed on the double width gravity conveyor above the machine on the right for delivery to the double spindle multihead drill press in the right background. Stud holes are drilled and tapped on this machine. The eye-bolt and set screw holes are drilled and tapped on another drill press, and the foundation bolt holes are drilled on the multihead drill press shown in the left background. This completes the machining cycle, and the frames placed on a gravity conveyor in left background, not visible in picture, for delivery to a press pressing the core in position.

GUIDE TO LOWER TOOLING COS WITH SHIELD ARC WELDED STE JIGS AND FIXTURES. This 8-page b letin, issued by The Lincoln Elect Co., Dept. E-234, Cleveland, Ohio, co tains some interesting photographs a descriptions of jigs and fixtures bu up by the welding process. Comparis are made between the cost of weld steel construction and cast iron co struction showing the saving that c be made by the use of welded st Copy free upon request.

WIEDEMANN TURRET PUNCHES. new catalog issued by Wiedemann M chine Company, 1817 Sedgley Ave., Phi delphia, Pa., illustrates and describes t various types and sizes of turret punch made by this firm. Included in t line are hand punches in a variety sizes and self-contained motor driv power punches. The gearing on t hand punches is ingeniously compoun ed so that as many as 12 punches c be used at a time and machine steel to ½ in. thick can be punched. A pr sure of 26 tons is possible with one these machines. Copy free upon reque

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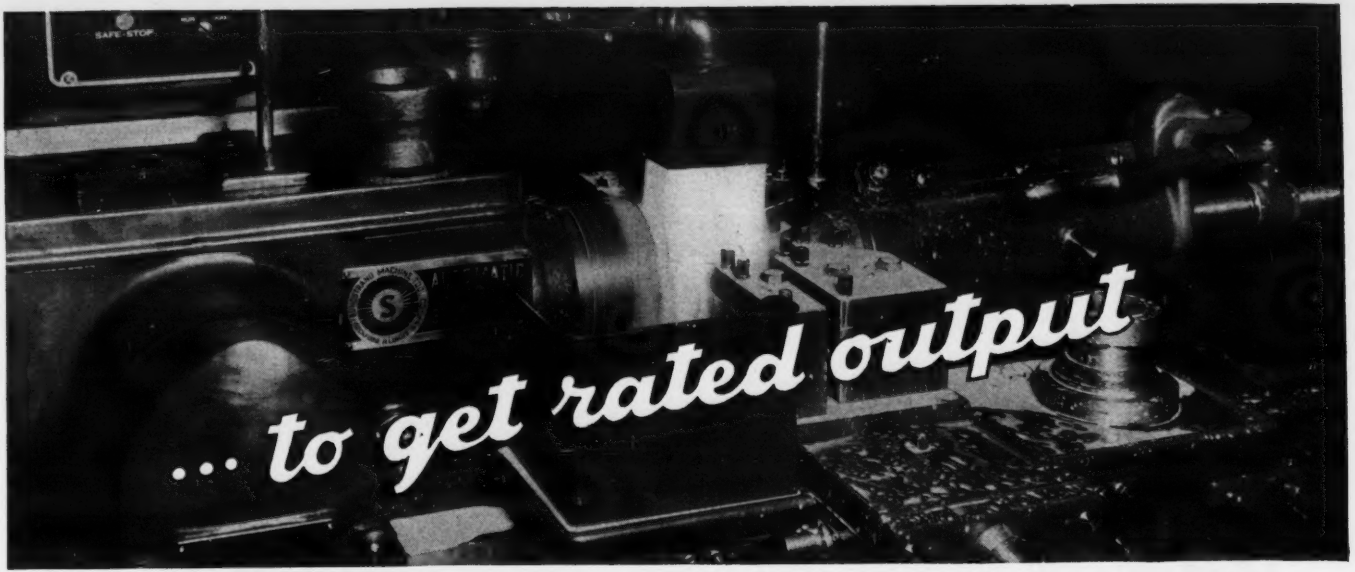
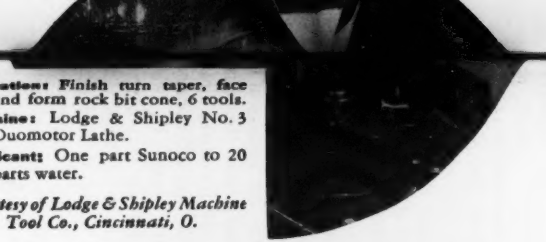


Courtesy of Sundstrand Machine Tool Co.

FLOOD TOOLS AND WORK *with* SUNOCO

Operation: Finish turn taper, face

Although the modern lathe meets all the high surface speeds with long runs between tool resharpenings — and that calls for an



Operation: Finish turn taper, face and form rock bit cone, 6 tools.
Machine: Lodge & Shipley No. 3 Duomotor Lathe.
Lubricant: One part Sunoco to 20 parts water.

Courtesy of Lodge & Shipley Machine Tool Co., Cincinnati, O.

Operation: Turning & facing.
Machine: Warner & Swasey 5-A Universal Hexagon Turret Lathe.
Lubricant: 1 part Sunoco to 15 parts water.

Courtesy of Warner & Swasey Company, Cleveland, O.

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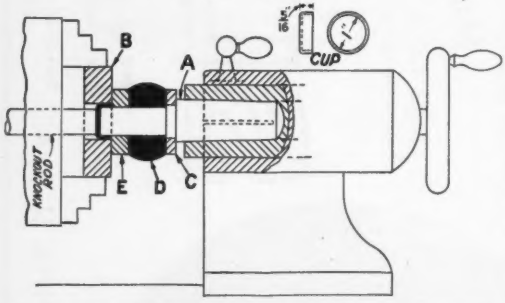
Ideas from Readers

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Drawing Sheet Brass Cups in the Lathe

By S. A. McDonald

AMONG the jobs that came into a small jobbing shop was one which included the manufacture of a number of brass cups 1 inch in diameter by $\frac{3}{16}$ inch deep. The cups were to be drawn to shape from 0.0312-inch sheet brass. The shop equipment did not include a punch press, consequently one of the mechanics made up a die with which the cups could be drawn to shape in an engine lathe. The die is illustrated in the drawing.

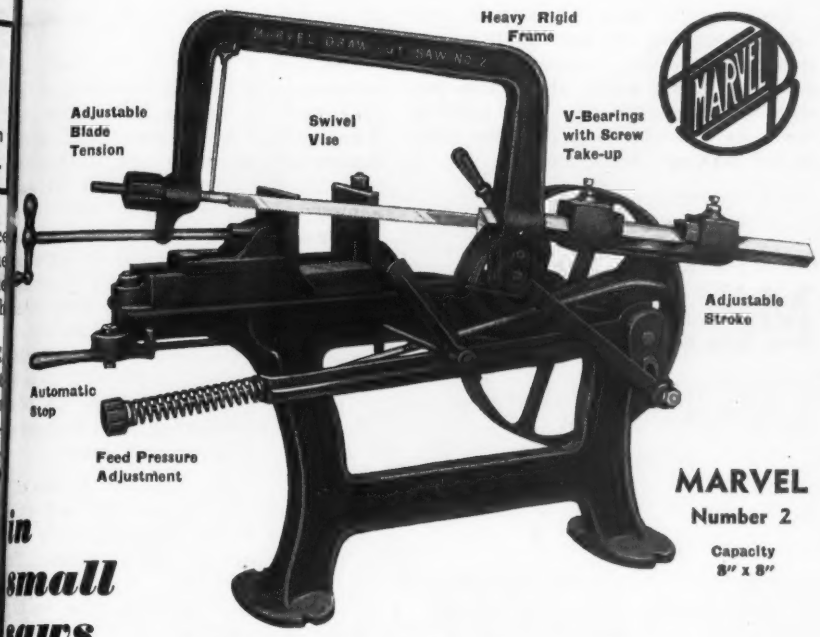


Drawing illustrating method of drawing brass cups to shape in the engine lathe.

The punch A was made from cold rolled steel, with one end turned to the correct taper to fit the taper in the tailstock and the other end turned to the dimension indicated for the inside of the cup. To make the die B he chucked a piece of cast iron, faced one side, bored a hole to the outside diameter of the cup, rounded the edge of the hole, made a circle on the face of the piece to aid in locating the blank centrally, and then polished the hole and face of the die to as smooth a finish as possible.

He next made the rings C and E. The ring C was bored to a press fit on the punch, and the ring E, which was intended to be used as the pressure ring, was made to a sliding fit. The pressure pad D was made from a heavy section of rubber, turned to the same diameter as the pressure ring.

The lathe was converted into a punch press by the simple expedient of locking the spindle with the backgears and clamping the tailstock close enough to the chuck so that the punch could be fed into the die. The size of the blank was determined by trial, and the pieces were cut to shape with shears after the circles had been drawn on the brass sheet with a compass. To form a cup, the blank was centered on the face of the die with the aid of the circle, then the punch was fed into the die by means of the tailstock handwheel. As the punch was fed forward, the pressure ring E gripped the work under pressure from the pressure pad D, which eventually expanded as it was compressed between the two rings. After the cup had been formed, the punch was withdrawn, the pressure pad stripping the cup from the punch. The cup was then pushed out of the die by the use of a knockout bar through the spindle.



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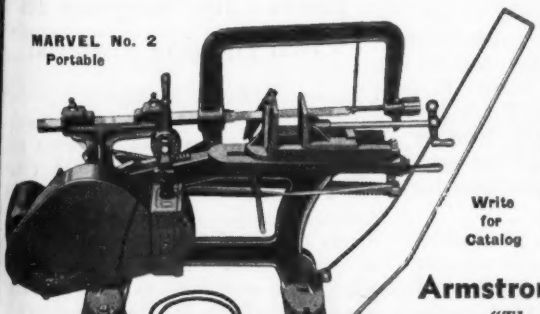

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Armstrong-Blum Mfg. Co.

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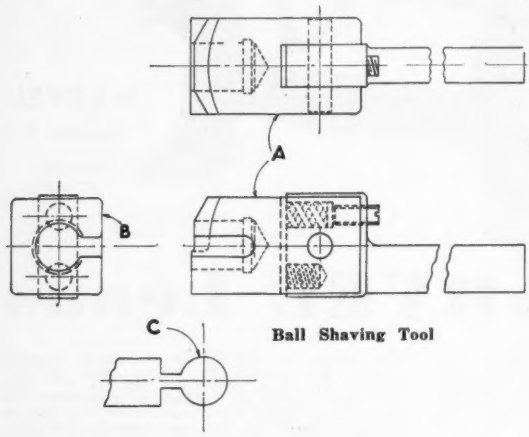
345 N. Francisco Ave., CHICAGO, U.S.A.

The results were so satisfactory that a blanking die was made up to operate in the same manner. One remarkable thing about the whole job was that the lathe used in making the cups was the only machine used in the making of the dies.

Ball Shaving Tool

By John Jergens

MANY types and kinds of devices for forming ball shapes have been designed and built, but the tool presented here has the merit of simplicity, in addition to which it is particularly applicable to production work. The tool is intended for finishing only, the ball being first formed to within 1/64 in. of finish size by the use of an ordinary forming tool or single point tool and the compound tool rest. In the latter case the rest is swung on a radius.



Ball Shaving Tool

The shank of the tool is of machine steel, heat treated, but the shaving tool is made from high speed steel, hardened and ground on the interior to the required diameter. Clearance of 15 deg. is ground on the cutting edge of the tool.

The tool is made in two parts, the forward part being attached to the rear part by means of a hinge pin. Two springs are incorporated in the design to aid in the operation of the tool. A side view of the tool is presented at A, showing the shank, springs, and location of swivel pin. From this side, also, can be seen the slot which turns the neck that connects the ball to the shaft from which it is being turned. The slot can be made any width necessary, as, for instance, if the ball is to be turned on the end of a piece that is to be used as a lever or handle.

As shown at B, the cutting edge of the tool is circular, although only half of the edge is used, for forming. By setting the tool so that the cutting edge is slightly below or above center, depending upon which way the spindle is revolving, a good finish can be obtained in a minimum of time. A finished piece is illustrated at C.

Brass Clip Supplies Its Own Brazing Material

By J. H. Hale

THE picture shows a brass clip that is used to provide anchorage for a heating element consisting of a nichrome coil. The clips were formerly attached to the coil by the use of silver solder, but silver solder is an expensive material to use in large quantities and it became necessary to find some other method of anchoring

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New applications of this nationally known high speed are constantly coming to light. It is just natural, however, that Red Cut Superior should be selected for the tips on this tool because of its proved ability to hold an edge at high temperature as well as its resistance to abrasion. In selecting tool steels, "Bank on Experience . . . not on Experiment". Get in touch with us.

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Brass Clip Brazed to Section of Nicrome Wire

the coil in the required position.

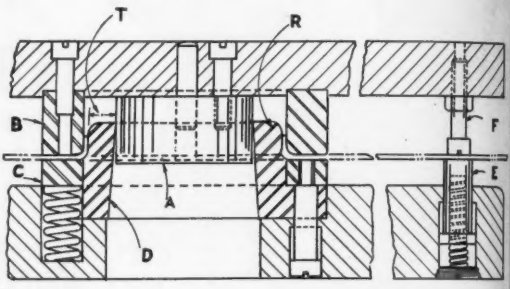
The clip was redesigned as shown so that the top part of the clip could be used as brazing material and thus the clip could be brazed to the nichrome wire, eliminating the need for silver solder entirely. in punching out the clip, a prong is formed and bent upward enough so that the wire can be slipped under it. The application of heat melts the end of the prong so that it brazes itself to the wire as shown in the illustration.

This is the only instance the writer has ever seen where the work-piece furnished its own brazing material.

A Good Piercing and Flanging Die

By David W. Mills

A CROSS section drawing of a punch and die designed to pierce and flange a round hole in one operation in a single-action press is shown in the illustration. The piercing punch A leads the forming ring B a distance equal to the thickness of the stock. The pressure ring C requires sufficient spring tension to strip the work from the die D. A radius should be formed on the corner of the die as indicated at R, equal to approximately double the thickness of the stock. If the work is very large, spring rest pins as shown at E will be necessary to keep the work in a horizontal plane. The studs F depress the spring rest pins equally.



Cross-section drawing of die for piercing and flanging a round hole in one operation in a single-action press.

The method outlined here is entirely successful on steel when the depth of the flange is sufficient. The shorter the flange, the less the thickness of the die ring will have to be at T. Successful results have been obtained on 15-gauge steel when the thickness at T was only $\frac{5}{32}$ inch. A good grade of steel was, of course,

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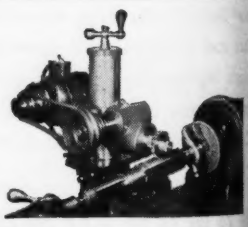

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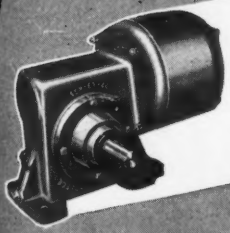

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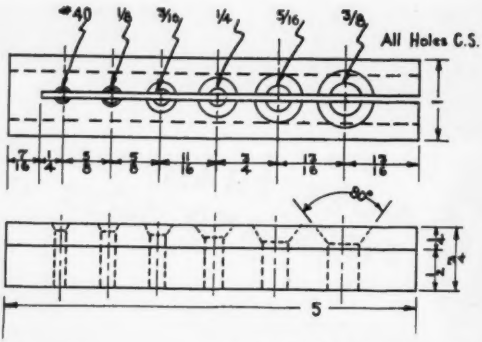
used for the die ring. However, if brass is the medium, there is a possibility of cracks being formed on the flange due to the hardening action on the brass during the piercing operation.



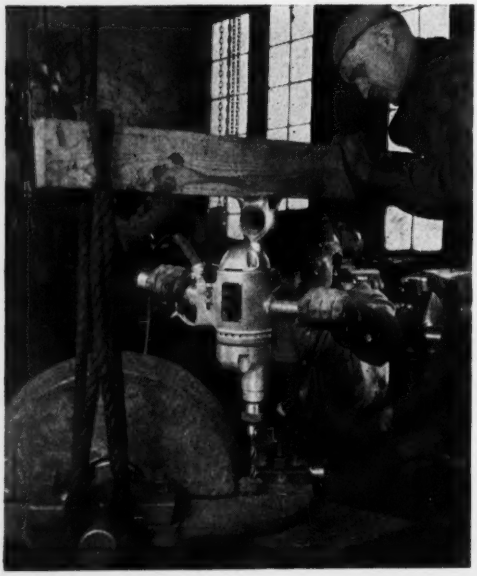
Emergency Rivet Header

Rivet Header

By C. F. Fitz

MOST mechanics who have done any amount of metal pattern or templet work know that it is very seldom that one is able to find an aluminum or copper rivet of the size needed for the job in hand. To eliminate this difficulty and make it possible to always have a rivet of the desired size at hand, the rivet header shown in the drawing was made.

The tool consists of a piece of tool steel of the size given on the drawing, with holes drilled and countersunk to the most popular rivet sizes. The tool is split as shown, with a 1/32-in. slitting saw, and the sizes of the holes are stamped on the face.



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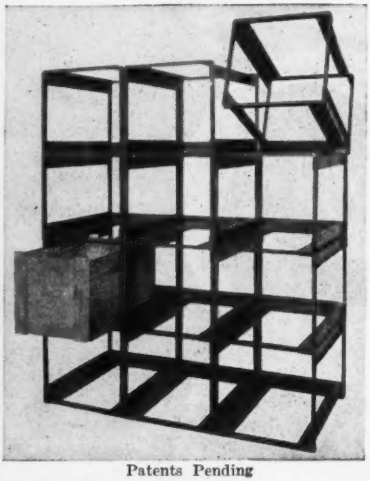

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The corners are smoothed up and th tool is hardened and tempered.

To use, a rod of the diameter re quired is selected and inserted throug the proper hole in the header with small portion protruding from the to face of the tool, then the header an rod are clamped between the jaws o a bench vise. The protruding end o the rod is struck with a hammer, up setting it so that it fills the cavit formed by the countersink and thu forming a countersunk head. The rive thus formed is cut off to the require length and is ready to use.

JOHANSSON GAGE BLOCK SET N 2. This folder is well illustrated wit pictures showing demonstrations of th many functions made possible by th use of the Johansson Gage Block Se No. 2, product of Ford Motor Company Johansson Division, Dearborn, Mich. Th blocks are shown in combination wit holders and jaws which adapt them fo use in checking taper shanks, boss diam eters, locations of holes in drill jig plug gages and other gages, and so on Copy free upon request.

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DIAMOND GRIP COLLETS. Catalo No. 12, issued by Sutton Tool Company 2838 W. Grand Blvd., Detroit, Mich. presents the collets, feed fingers, and other automatic and hand screw ma chine accessories produced by this firm The book contains 28 pages devoted to Sutton Diamond Serrated Collets, Sut ton Style L Master Feed Finger with interchangeable and replaceable pads, full floating collets, lathe and milling machine collets, and other Sutton tools. Illustrations, descriptions, specifications and prices are given for Sutton Diamond Serrated Collets for all types of screw machines. Copy free upon request.

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Over the Editor's Desk

Unnecessary Noise

OUR modern civilization is a noisy one. From the time the milkman's horse wakes us up in the morning with the sound of his steel shoes on the pavement until the last radio in the neighborhood has been turned off somewhere around midnight our ears are constantly assaulted by noises of every description—most of them of a type which could be eliminated or subdued if necessary.

Considering that the average industrial worker spends more of his waking hours at work than he spends in his home, it is evident that conditions surrounding his task must have their effect upon his well-being. Industrial noises have, in the past, generally been considered as necessary, but the fact is that they have had their effect upon the individual and upon production.

Noises caused by air hammers, badly-fitted gears, loose-fitting mechanisms, badly-joined belts, and so on tend to distract workers and make it difficult to concentrate upon the task in hand, with consequent lowering of efficiency. The best and fastest workers are usually the most intelligent, and the more intelligent a person is, the more sensitive his nervous system is likely to be. The result is obvious.

A Sectional Committee of Noise Measurement has been formed to work on a series of standard under the procedure of the American Standards Association. The first task will be to set standards for sound measurement so that sounds can be measured and studied with a view to eliminating all unnecessary noises and finding ways and means to dampen those that cannot be completely avoided. There is a great deal that can be done in this field and it is our belief that the results will more tha justify the effort.

Business

AS we go to press the America Locomotive Company has unfille orders on its books amounting t $9,500,000, as compared to $2,800,00 a year ago. President Wm. C. Dicker man says that prospects are more pleasing than any time in the las five years. Evidence that a large potential demand exists.

A gain of 225,000 in employment in industry during March was reported by Secretary of Labor Perkins. Weekly payrolls in two industries surveyed by the Bureau of Labor Statistics were $10,000,000 and $2,000,000 more than a year ago.

The April gross revenue of the New York Central Railroad was approximately $3,000,000 ahead of the corresponding month last year.

The Kelvinator Corporation's factory payroll was 74.3 per cent higher in March of this year than in March of 1935. This figure will undoubtedly come close to being an average for the refrigerating unit industry.

According to advices from Detroit, the automobile factories are running day and night, pay-rolls are at near-record levels, and a huge backlog of orders has been rolled up from dealers all over the country. Production of motor vehicles totaled 323,160 units in March as compared with 280,758 units in March a year ago. Sales of General Motors cars and trucks to dealers in overseas markets during March totaled 32,798 units, which is the highest sales volume of any month since May, 1929. Later reports are expected to show that total production for the month of April exceeded 500,000 units.

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New Shop Equipment

Rockford Automatic Hydraulic Horizontal Drilling Machine

The machine illustrated has been built by Rockford Drilling Machine Co., 300 Catherine St., Rockford, Ill., especially for drilling, reaming, and countersinking holes in the flange of a large crankshaft. The machine is equipped with a 5-station fixture and performs the operations in the following sequence: Station 1 load and unload work pieces; Station 2 drill six holes and mill out center of flange; Station 3 drill two locating holes; Station 4 countersink six holes and ream two locating holes; Station 5 tap six holes.

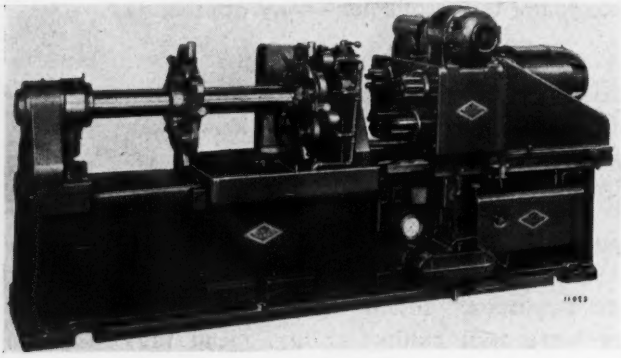


Fig. 1—Rockford Automatic Hydraulic Horizontal Drilling Machine

Figure 2 shows one of the finished crankshafts together with the 23 cutting tools which operate simultaneously in performing the operations listed above. Especially interesting is the use of the hydraulic circuit for tapping, which is a patented feature of this machine.

The base of the machine is large and contains the hydraulic equipment with centralized control, coolant pump and reservoir. Mounted at the right hand end of the bed is a traveling head having automatic hydraulic cycle of rapid approach, feed, dwell for finish on milling and countersinking, rapid return and stop. The automatic operating cycle is governed by easily adjusted dogs. A central push button station provides for complete control and the machine can be stopped at any point in its cycle.

The head has two motors; one to supply driving power and the second to drive the group of tapping spindles independently. The second motor reverses automatically for rapid return upon completion of the tapping operation. This arrangement avoids reversing the main driving motor and thus protects it against excessive overloads. Another advantage is that the drills, milling cutter, and countersinks do not rotate backward when leaving the work. The 23 spindles are arranged in four clusters in a detachable plate in the front of the head. This construction makes it possible to adapt the machine

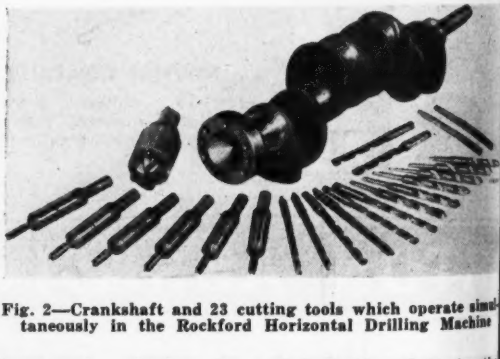


Fig. 2—Crankshaft and 23 cutting tools which operate simultaneously in the Rockford Horizontal Drilling Machine

to engineering changes in work pieces or for a variety of work.

At the left of the traveling head is the 5-station fixtures in which two work-holding heads are mounted on a heavy central shaft that rotates in anti-friction bearings for easy indexing. One of the work-holding heads is adjustably mounted on the central shaft to accommodate work pieces of a varying lengths. An integral cup gage in the fixture facilitates accurate location of work pieces. An electrically operated locating plunger aids in rapid manual indexing of the fixture and a manually operated guide bar locks the fixture securely in position during machining. Work is flushed with a copious supply of coolant while the machine is in operation. The combination of a 5-station fixture with a locating gage, simultaneous operation on four work pieces and automatic operating cycle results in a production capacity which is limited only by the longest operation — that of drilling the six 37/64-in. holes 1 9/16 in. deep.

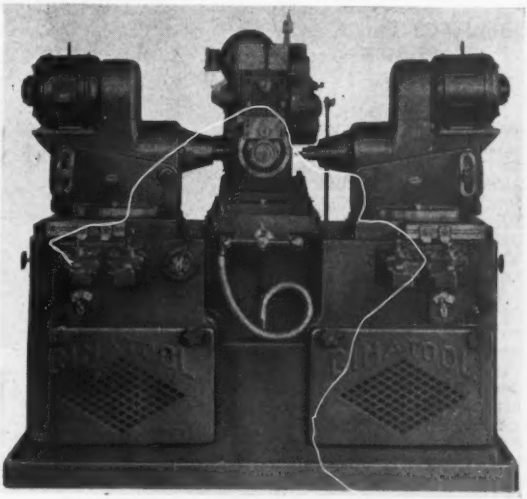
Cimatool Peerless Duplex Gear Chamfering Machine

The line of Peerless Gear Tooth Chamfering Machines made by The Cimatool Company, June & East 3rd Sts., Dayton, Ohio, has been augmented by the development of a hydraulically operated double spindle machine. This machine, which is larger and heavier than previous tool of this line, chamfers and burrs all external gears up to 13 in. diameter, utilizing cutting speeds as high as 300 teeth per minute.

Retaining the same flexibility and variety as regards shapes of chamfer and roundness that characterize the other Peerless Gear Tooth Chamfering Machines, the new machine permits chamfering of two teeth simultaneously on the same gear, thus cutting production time in half. The heavy anti-friction bearing work head provides a continuous rotating indexing action, timed with a forward and backward motion produced by a cam so developed that the resulting rotation and longitudinal movement presents the teeth to the cutter in the necessary fashion to give the face of chamfer desired.

The cutter spindle is mounted in a stationary position during the cutting operation, thereby providing the added rigidity necessary to vibrationless operation. For loading and unloading, the cutter spindle is moved out of cutting position by hydraulic controls.

All hydraulic controls are convenient to the operator and both hydraulic and coolant pumps and motors are accessible by removing front cover plates. The work head in the center, on which the work piece is mounted, is located on a table which has front-to-back movement



Cimatool Peerless Duplex Gear Chamfering Machine

on a straight dovetail slide. Hydraulic clamping is provided with adjustment by means of a ball crank handle with a properly graduated dial. The work head is located on an intermediate incline which provides for rapid adjustment of the work vertically above or below center. The work spindle itself is completely sealed so that lubrication is retained and chips are excluded.

The work head drive utilizes a standard electric motor driving a reduction unit integral with the work head by V-belt and pulley. A wide variety of production speeds are available by simply changing pulleys. The cam shaft diameter has been increased, with bearing supports on both ends of the shaft and an adjustable take-out is provided through the entire head on all mating gears and worms. The cutter spindles

on each side of the work head may be swiveled in a horizontal plane to obtain any required angle of chamfer. A vertical swivel tooth cutter spindle makes possible chamfer or roundness desired on helical gears. Rapidity and convenience in setting up are made possible by graduated scales on both cutter spindles and on the work heads. Each cutter spindle has an independent motor drive and hydraulic cylinder to provide the necessary movement for loading and unloading.

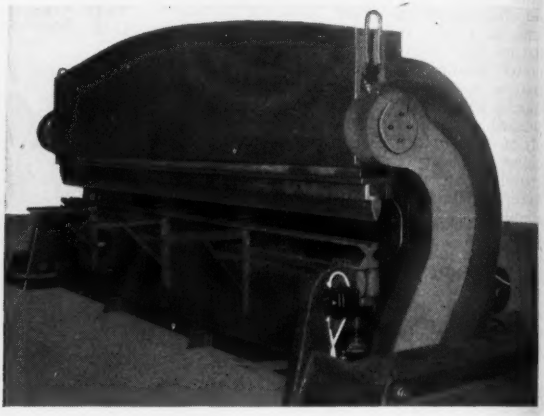
Boom 500-Ton Capacity Steel Press Brake

A 500-ton capacity steel press brake said to be one of the largest of its type ever manufactured, and capable of bending material 16 feet long, is announced by the Boom Boiler and Welding Company, 2313 Elm St., Cleveland, Ohio

Revolutionary in design, the Boom brake pulls two leaves together instead of merely pushing one leaf down. The design eliminates approximately 30 per cent loss in material and permits easy adjustment for bending by raising or lowering the bottom leaf which is moved by worm drive controlled by a switch mounted on the front of the machine. All driving mechanism, adjustment shafts, and so on, are below floor level, leaving the entire top clear.

The new brake is 24 ft. 2 in. long, 16 ft. 1 in. long between housings, 7 ft. 1 in. wide, 9 ft. 11 in. high, and 6 ft. 9 in. high above the floor. The weight is 61 tons. The two leaves of the brake are 17 ft. 7 in. long, 4 ft. high, and 10 in. thick, and weigh 8 tons. Links are 8 ft. 3 in. long overall, 8 in. thick and 3 ft. 4 in. wide from drive center to the outside of the link.

Bending members are of high carbon steel, machined to meet bending requirements. Housings, both inner and outer, are 6 ft. 8 in. long. The inner housing is 8 ft. 11 in. high, and the outer is 3 ft. high.



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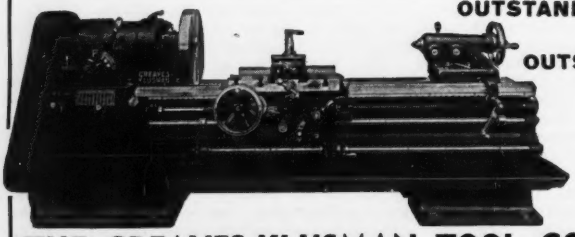
Construction is entirely of steel, arc welded, providing maximum rigidity per minimum pound of weight. Power for operating the brake is furnished by a 30 h.p. electric motor in conjunction with a 2-ton fly wheel and transmitted by V-belts to gears and shafting. Oper-



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What Are Their Uses?

By E. B. Gallaher
Editor, Clover Business Service
Treasurer, Clover Mfg. Co.

● UNDER this caption we have published 11 ads—run serially during the past year.

● They have attracted so much favorable comment—there have been so many requests for reprints from schools, colleges and from individuals—that we have published them in pamphlet form, and now offer the series in a neat little booklet.

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Coated Abrasives?
What Are Their Uses?"

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● Yet, we must admit that comparatively little is known about them—the various kinds of abrasive materials employed—the various methods of coating and the various backings in use.

● As every class of work can best be done with some one of the combinations of grain, coat and backing available, it behooves those who use and sell Coated Abrasives to acquire sufficient accurate information regarding them, that they may obtain what they need.

● To suggest what to use, and how to order, is the purpose of this little pamphlet. It is sent, without cost, for the asking.

● Manifestly, this pamphlet should be kept handy, as it will be referred to continuously.

Gallaher

CLOVER MFG. CO., NORWALK, CONN.

Also makers of the famous
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ation is two-speed; 4 or 20 strokes per minute. The machine is available in a variety of sizes and types.

Ex-Cell-O No. 48 Carbide Tool Grinder

The Ex-Cell-O Style No. 48 Carbide Tool Grinder, a product of Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich., is designed for grinding all sizes of single point turning, facing and boring tools, right or left hand, high speed steel and

Ex-Cell-O No. 48 Carbide Tool Grinder

cemented carbide tools of the larger size range. Both peripheral grinding on straight type vitrified wheels and face grinding on cup type vitrified wheels can be done on this machine.

The grinder is of the double-end type equipped with commercial ball bearings and driven by a double "V" belt from an electric motor located in the base. Adjustable tool tables with hardened and ground surface are provided for each end of the machine, one for using a straight wheel and the other for a cup wheel as illustrated. If it is desirable to replace the cup wheel with a straight wheel, another table furnished as extra equipment is used the same as shown in

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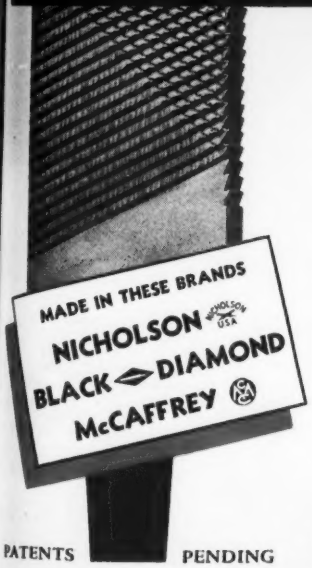

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At your mill supply dealer's. Nicholson File Company, Providence, R. I., U. S. A.

A FILE FOR EVERY PURPOSE

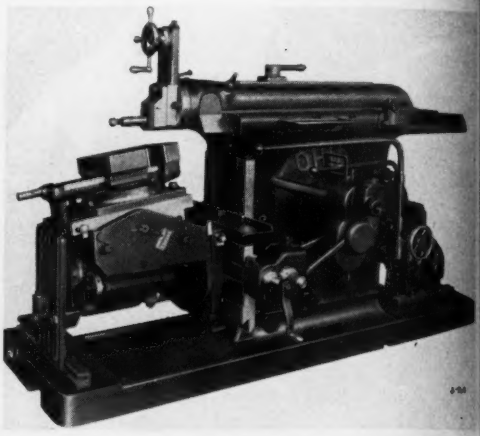
the photograph at the left end of the machine. A slot is provided across the face of each table to guide the wheel dresser and angularly adjustable tool protractor. A graduated scale is provided on each table for adjusting the table up to 16 deg. above or below center. The base of the machine is a heavy one-piece casting.

As this machine is designed for dry grinding, a dust exhaust opening is cast at each end of the machine base below the grinding wheels. At the front of the machine base is mounted a tool tray and switch compartment.

The wheel spindle is driven by a one horsepower, 1800 r.p.m., 220 volt, three phase, 60 cycle open frame ball bearing motor. The motor can be furnished for use on direct current if required. The drum type switch which is mounted in the switch compartment is used for starting, stopping and reversing the rotation of the wheels for grinding right or left hand tools. Either 10x1½ x2-in. straight, or 10x2x2-in. or recessed 5-in. diameter by 1 in. deep on one side of cup wheels can be used on this grinder.

table and the vertical movement of the cross rail.

A single lever stops, starts and reverses the feed. The large diameter feed change dial is so arranged that the operator simply turns this dial to the amount of feed that he desires. A safety



Ohio One-Position Controlled Shaper

Ohio One-Positioned Controlled Shaper

Controls on the Ohio Dreadnaught Shaper made by the Ohio Machine Tool Company, Kenton, Ohio, have been regrouped and improved so that an operator can make all the necessary speed feed changes without leaving his regular position by the table of the machine. The entire grouping of the feed control is now located at the end of the rail, in connection with the power rapid traverse for the cross movement of the hand crank, equipped with a dial graduated in thousandths, is an asset for hand operation. Power rapid traverse control is through a push button station marked "toward" and "away."

The control of the length of stroke of the ram has been worked out to a fine degree and all the operator has to do to adjust the length of the stroke is to put his crank on the squared end and turn it until the length of stroke is read directly on a dial at this position. The removal of the crank from the squared end automatically locks the stroke in a positive manner. It is im-

GRINDS . . .

Cutters—Reamers—Drills

Inexpensive—Simple Set Up—Accurate

Will sharpen every type and size of cutters (plain, side and end-mill, helical, Woodruff, gear, angle, convex, forming, T-slot, etc.) Hobs, Metal Saws, Reamers, and Drills from No. 52 to 1¼".

Write for complete details.

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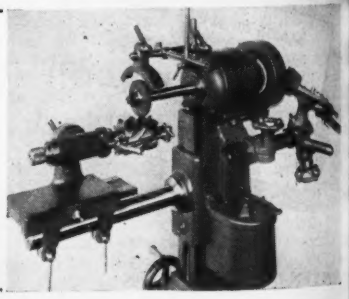

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SOUND THINKING, SO WELL PORTRAYED HERE BY RODIN'S FAMOUS STATUE "THE THINKER," HAS ENABLED SUCCESSFUL INDUSTRIAL ENTERPRISES TO SOLVE THEIR MOST DIFFICULT PROBLEMS THROUGH EVERY PERIOD OF BUSINESS UNCERTAINTY. ★ SOUND THINKING ON DRILLING AND REAMING PROBLEMS, WE BELIEVE, WILL BRING YOU TO THE CONCLUSION THAT THE 59-YEAR OLD PREFERENCE FOR "CLEVELAND" TWIST DRILLS AND REAMERS IS INDISPUTABLE PROOF OF LOWER COST-PER-HOLE PERFORMANCE. ★ "CLEVELAND" DRILLS AND REAMERS ARE ALWAYS MARKED WITH THIS SYMBOL ◇C◇ . IT IS THE MARK OF GOOD TOOLS THOUGHTFULLY MADE.

★ ★ ★ ★ ★ ★

THE CLEVELAND TWIST DRILL COMPANY, *Cleveland, Ohio, U. S. A.*

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DURANT MFG. CO.

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possible for the device to slip. Controls for the clutch, brake and speed change have been grouped into a small circle.

Weidemann Type R-5 Power Operated Turret Punch With Special Gage.

The illustration shows the Wiedemann Type R-5 heavy duty motor driven turret punch with metal work table and

Wiedemann Type R-5 Power Operated Turret Punch with Special Gage

graduated rear gage bar which is now being built by Wiedemann Machine Company, 1817 Sedgley Ave., Philadelphia, Pa. The machine has been especially arranged to punch knock-outs in electrical conduit boxes and is equipped with 12 knock-out dies, all of which are instantly available by revolving the turret to bring the punch for the required size into the front position.

The 6 single knock-out dies are arranged in sequence from ½-in. diameter conduit to 2-in. diameter conduit inclusive, the other stations having concentric dies as follows: ½x¾ in.; ¾x1 in.; 1x1¼ in.; 1¼x1½ in.; 1/2x¾x1 in.; ¾ x1x1¼ in,. the last die also being 60

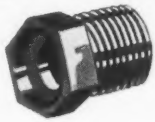
IT'S EASY TO UNDERSTAND HOW . . . . .

UNION COLD DRAWING
Increases Production Efficiency

It increases working strength, frequently permitting reductions in size and weight of steel parts.

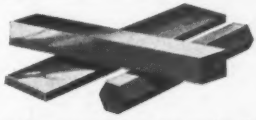
It gives steel bars a smooth, bright finish which is largely retained as a quality feature of parts like this.

It eliminates any need of machining to obtain close accuracy where the cross section of the bar corresponds with that of the part.

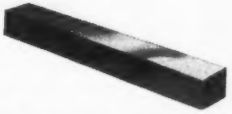


The high increase in machinability which it provides means big savings when making parts like this.

Union Cold Drawn Rounds are accurate to size and concentricity within close tolerance, smooth surfaced and uniform in cross section throughout their length.



The sharp corners, accurate angles, flat, smooth surfaces and parallel sides of Union Cold Drawn Flats, Squares and Hexagons are extremely important advantages with many applications.



The lustrous surface of Union Cold Drawn Bars provides good appearance for many applications. If desired, plating, lacquer, paint or enamel can be applied without further surface preparation.

Many applications benefit by the increased wear resistance which Union Cold Drawing gives to steel.

PROMOTE EFFICIENCY WITH

Union Cold Drawn Steels

designed that ½x¾x1x1¼ in. can be punched when necessary.

When punching ordinary sheet steel, any thickness up to No. 11 gauge can be used, a depth adjustment to the ram being provided to insure punching clear through the sheet without breaking the slug out. The back gage bar has in-and-out movement by double screws with full length scale set in the right hand edge of the table for setting by hand wheel in the front of the machine. The gage bar is 78 in. long, is graduated in 32nd's for 24 in. at each end and can be equipped with an adjustable end stop at one or both ends.

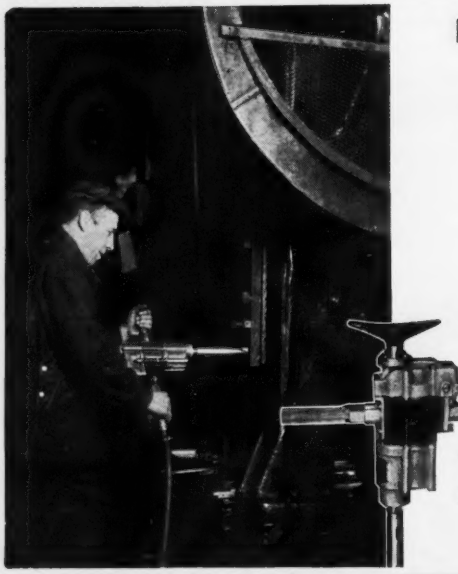
The hand wheel on the right hand screw is standard, the left hand wheel shown being furnished as an extra. The steel plate table is approximately 39 in. wide by 23 in. deep and is supported by four cast iron brackets bolted to machined pads on the base of the machine, these also being the bearings for the gage screw.

Carboloy 6-In. and 10-In. Pedestal Grinders for Carbide Tools

Two new pedestal grinders of 6-in. and 10-in. size, designed especially for the grinding of cemented carbide tools, have been announced by Carboloy Company, Inc., 2975 E. Jefferson Ave., Detroit, Michigan. The grinders have been developed to meet all requirements necessary for grinding carbide tools rapidly and efficiently and are said to be suitable not only for resharpening tools dulled in ordinary use but also for the rapid reconditioning of carbide tools on which the tip has accidentally been broken, the reshaping of carbide tools, and the rapid grinding of milled and brazed carbide tools which have been completed except for the grinding operation.

The 6-in. grinder is designed for the interchangeable use of silicon carbide cup wheels (for roughing and finishing), diamond wheels and lapping discs. The machine is intended for plants that use carbide tools in the smaller size range (up to about ⅝ in. square) and a relatively few larger sizes of tools. This machine supplements the larger 10-in. grinder for plants where the tools require reconditioning on diamond wheels or lapping discs.

The 10-in. grinder is designed for both peripheral grinding on straight silicon



ROTOR E-40C DRILL
(reverse or non reverse)
Capacity 7/8" in steel.

For—Drilling
—Reaming
—Woodboring

A powerful, rugged tool for production work.

The speed is controlled by an automatic governor to reduce air consumption, give high load speed and to prevent excess wear.

Try one for 10 days at our risk.

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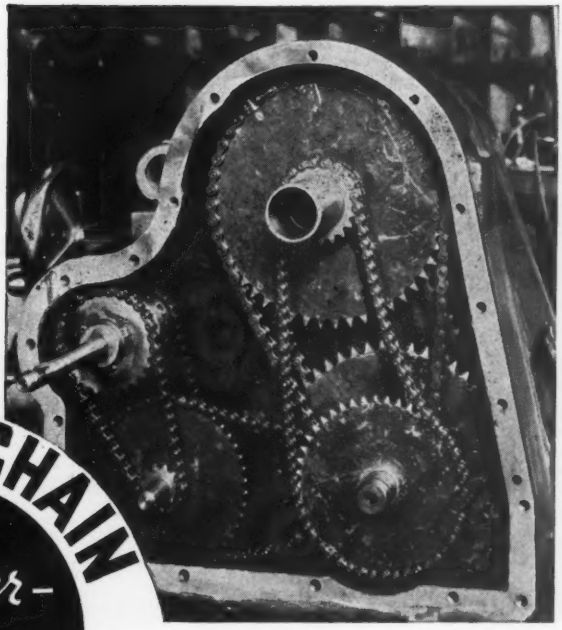


There are seven ½" pitch chains in this brake-drum lathe headstock.

ROLLER CHAIN is Quieter—Less Expensive •HERE•

Hardened steel sprockets and precision machined roller chain—both of Baldwin-Duckworth manufacture, replaced a chain of gears in this brake-drum lathe headstock. The manufacturer saved money because the cost was less. The owner was pleased because the lathe was quieter and easier to service. He benefited from the cost saving, too.

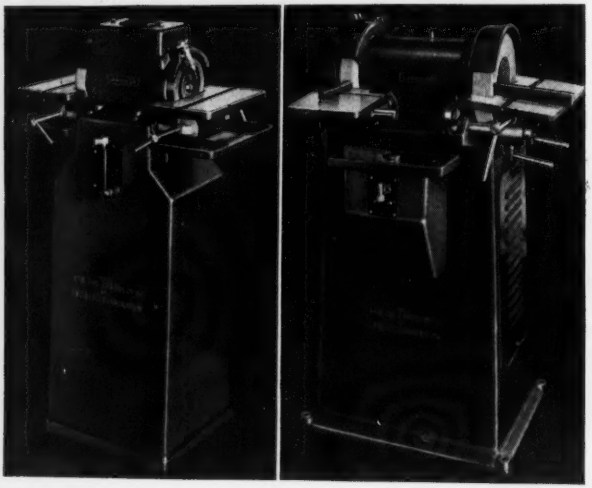
Today, almost any conveying or power transmission job can be done economically with roller chain. Get acquainted with the Baldwin-Duckworth engineer in your territory. Baldwin-Duckworth Chain Corporation, Springfield, Mass.

BALDWIN—DUCKWORTH

carbide wheels and for face grinding on cup wheels. Both roughing and finishing can be done on the one machine.

Provision is made for rapid wheel changes when necessary. Access can be had to straight wheels for changing by simply loosening a single wing nut cover. Cup wheels are reached by merely sliding back the tool rest tables. V-belts are accessible by simply removing one wheel guard and side louvre. Exhaust outlets are provided for rapid connection to blower systems.

Both machines are provided with hardened tool rest tables sufficiently large for all sizes of tools, graduated protractors being provided for accurate setting of tables to 20 deg. above or below horizontal. Reversible motors facilitate grinding of either left or right hand tools. The motors are mounted inside the pedestals and are insulated to eliminate vibration. The 6-in. grinder is provided with reservoir and needle valve for lubrication of diamond wheels.



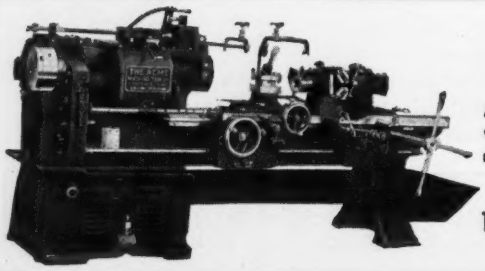
Carboloy 6-In. and 10-In. Pedestal Grinders for Grinding Cemented Carbide Tools

Oilgear 35-Ton Two Column Press

Stress concentration due to tool marks and sharp corners is eliminated in rear axle housing tubes by a push broaching operation performed on the 35-ton two column vertical press illustrated herewith. The press is a product of The Oilgear Company, 1403 W. Bruce St., Milwaukee, Wis.

Each housing tube is placed in a locating and holding fixture on the base and back wall of the press, and the 1 11/16 in. diameter broaching tool is threaded in one end of the tube. The hand lever or foot pedal is then depressed and the ram moves down, lubricant automatically flowing onto the tool and work for the broaching operation. When the end of the tube has been broached, the tool drops to the base and the ram returns automatically to starting position, the flow of lubricant stopping automatically. The tube is then removed and another inserted. All chips are flushed into a collecting chamber and basket on the side of the press.

The press is of welded steel construction with enclosed control mechanism, a bottle type double acting cylinder, in-



Cincinnati Acme Universal Turret Lathes

A powerful rigid machine for a wide range of accurate bar and chuck work.

Write for circular.

THE ACME MACHINE TOOL COMPANY
CINCINNATI, OHIO

SUPER DUTY
FILES By "CLEVELAND"
Check O.K. when tested . . .
. . . for instance, one user states: " . . . are pleased to advise that they (SUPER-DUTY FILES) proved better than the brand we have been regularly using."
And another has this to say: "Our factory likes your SUPER-DUTY FILES so well that we cannot accept substitutions."
Such statements, exact quotations, indicate that SUPER-DUTY files are surely Superior Cutting Tools and can be unconditionally guaranteed to meet fully the severest specifications and produce work at minimum costs. Your work Deserves SUPER-DUTY Quality. Specify them from your distributors.
THE CLEVELAND FILE CO. U.S.A.
SPECIFY
SUPER
DUTY
BRAND
EXCLUSIVE MFRS.
QUALITY FILES SINCE 1899

DRIVER "900" Drill Press

D925

$35.00

Bench model with standard pulley and motor belt, less motor. Slow speed pulley with 2 SKF ball bearings available extra $2.95.

Floor model available with 60" column.

Modern design, low operating cost, dependable service—these and many other features justify your making a point-by-point comparison with any drill press of like capacity.

Features: 6 splined spindle. 4 SKF ball bearings. Jacobs 0 to ½" Key Chuck. Table size 10"x9" adjustable to tilt any angle. Diameter steel column 2¾". Spindle travel 4". Steel quill 1 13/16" diameter with teeth to match feed pinion milled into it. Speeds standard pulley 600-1250-2440-5000 R.P.M. Speeds slow speed pulley 480-940-1300-2900 R.P.M. Height over all 39½". Shipping Wgt. 125 lbs.

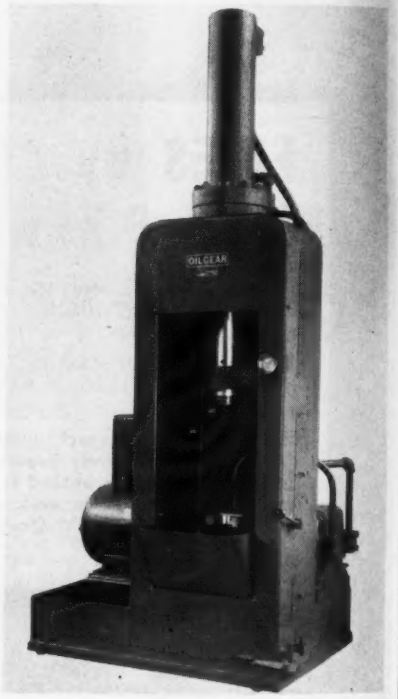
Write for Bulletin DP6

Walker-Turner Co. Inc.

Plainfield, N. J.

tegral pump and motor base, and a new series variable delivery pump. The main press structure, consisting of the press base, pump and motor base, side frames, rear wall and yoke, are welded into one uniform, compact piece.

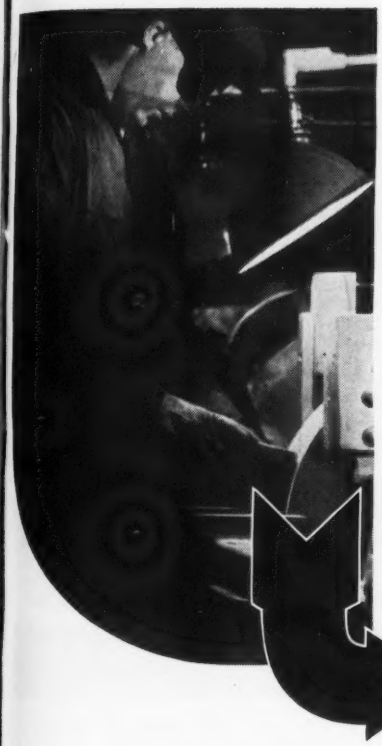
The semi-automatic hand lever and foot lever control mechanism is concealed in the right hand side frame. Removable covers facilitate adjustment of



Oilgear 35-Ton Two Column Press

the stroke. Both the pressing and return ram speeds can be predetermined or varied during the cycle by the operator. No external control valves are used and only two pipe lines from pump —one to either end of the press cylinder —are required. A 9½-in. bore bottle type double acting cylinder, with large bronze bushing in the yoke to guide the ram, is belted to the top of the press. Pipe connections are flanged to the cylinder.

Fluid power is provided by an Oilgear Type "DH-3511" Variable Delivery Two-Way Pump direct connected to a 30 h.p. 900 r.p.m. electric motor. Smooth, posi-



RESINOID BOND

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X-BOND VITRIFIED

TRADE ABRASIVE MARK REGISTERED

SNAGGING WHEELS

COOL, FAST GRINDING

ON HIGH AND LOW SPEED EQUIPMENT

Specially developed bonds—RESINOID BOND for speeds up to 9,500 surface feet per minute and X-BOND VITRIFIED for speeds up to 6,500 surface feet per minute . . . These enable Abrasive Company Snagging Wheels to withstand severe conditions of use and show outstanding performance records . . . Their cool, fast-cutting action results in faster stock removal at less cost. Compare them on the basis of cost per pound of metal removed and hours of wheel life by trying them in your cleaning room . . . Experienced abrasive engineers are available to assist in making recommendations for your conditions of use . . . May we send details?

ABRASIVE COMPANY

TACONY AND FRALEY STREETS, PHILADELPHIA, PA.

DIVISION OF SIMONDS SAW AND STEEL CO.

tive and controlled ram motion is obtained through a servomotor hydraulic control which increases, decreases, and reverses the stroke of the pump. When the press control is in neutral position and the ram is idle, no oil is pumped or bypassed; thus the power input is reduced to the minimum.

The press has a normal capacity of 35 tons, with a peak capacity of 48 tons. The 30-in. stroke on the down speed can be adjusted to provide a maximum of 15 ft. per minute with a maximum of 30 ft. per minute on the return speed. The distance between the side frames is 24 in. and from front to back is 20 in. Height of the table is 14 in. and the overall height is 144 in. Floor space, front to back, 60 in. and floor space, right to left, 72 in. Net weight, 9600 pounds. The fixtures on this type of machine can easily be changed or removed, making the press available for other broaching operations, assembling, straightening and so on.

Reinecker Heavy Duty Spline and Pinion Hobber

George Scherr Co., Inc., 128 Lafayette St., N. Y., is now marketing a new line of Reinecker Spline and Pinion Hobbers designed throughout for heavy duty requirements and to fully utilize the possibilities of modern cutting tools. They are available in three different sizes as regards diameter and pitch capacity and each size can be furnished in practically any length required.

The machines have been designed so that they will be equally adaptable for large or small lot production. This achievement has been obtained by developing a number of standard or extra attachments, by means of which the following principal classes of work may be handled: hobbing of straight multiple spline shafts; hobbing of spur pinions and gears; hobbing of spiral spline shafts (through differential); hobbing of spiral pinions and gears (through differential); hobbing of multiple threads (through differential), and milling of single or multiple threads (by means of a special cutterhead and single indexing attachment.)

In spite of the difference in form of work involved, all of these operations are essentially alike. The principle employed remains the same, viz: the hob or cutter performs the rotating cutting action as well as the traverse parallel to the axis of the work while the work itself remains stationary except for the gen-

MR. WELL DRESSED BELT...
TAKES A HITCH IN YOUR BELTING
It's really possible, through regular dressing of belts, to take a slice off per-unit costs. Faithful treatments with Research Belt Dressing keeps belting young—results in 5-25% more delivered HP, increased average machine speed and more units per hour. Get a can from your distributor—or write the Home of Research, Worcester, Mass.
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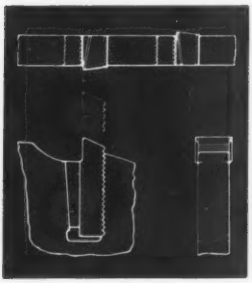
WORCESTER . . . MASS.
QUART $1.00
½ GALLON $1.50
GALLON $2.75
5 GALLONS $12.50
RESEARCH BELT DRESSING
from the Home of Research

Ingersoll Tri-Lock

TRIPLE SERRATED BLADE



NARROW KEYWAY OR SLOTTING CUTTERS

WIDTH OR DIAMETER EASILY MAINTAINED BY TRIPLE SERRATED BLADE LOCK. LOW REPLACEMENT COST FOR NEW BLADES.

The Ingersoll Tri-Lock Triple Serrated Blade Cutter represents the ultimate in an inserted cutter blade lock. Three sets of serrations are incorporated in the blade and wedge, each set of serrations permitting individual adjustment of a member. The Ingersoll Tri-Lock Cutter Blade has horizontal and vertical serrations on its faces. The horizontal serrations permit adjustment in a diameterical direction, compensating for the major wear of the Tri-Lock Cutter Blade. The vertical serrations permit sidewise adjustment of the Tri-Lock Cutter Blade, enabling the cutter to be accurately held to size. The double set of vertical serrations in the wedge securely lock the cutter blade in all directions.

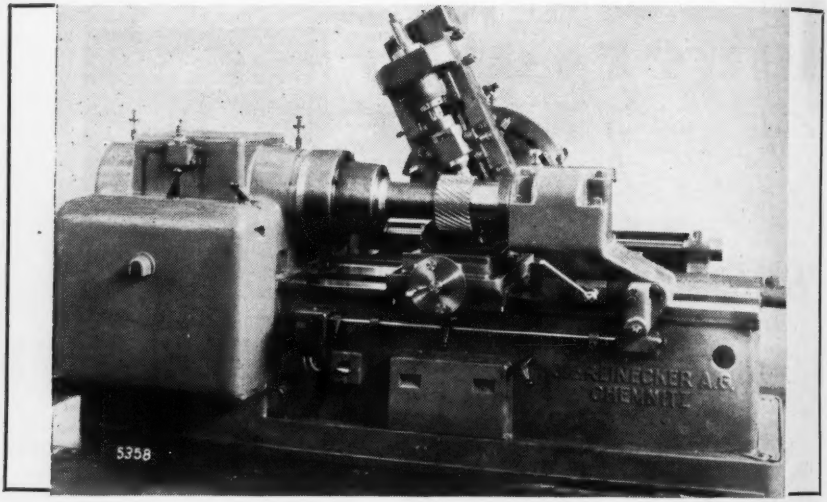
Using the Tri-Lock Cutter Blade Ingersoll offers the only narrow inserted blade slotting cutter. Cutters as small as 3/16" wide can be made.

● Cutters are made with Ingersoll Tri-Lock Cutter Blades of special selected high speed steel fitted into a forged and heat treated alloy steel body.

Write for Literature

HAVE INGERSOLL ENGINEER YOUR CUTTING TOOLS... STANDARD OR SPECIAL

THE INGERSOLL MILLING MACHINE COMPANY, ROCKFORD, ILLINOIS, U. S. A.



Reinecker Heavy Duty Spline and Pinion Hobber

erating rotative motion.

The machines can be furnished either as spline and pinion hobbers or as thread millers only, or as a combination of both. The various units are of unusually massive and rigid construction. A heavy adjustable follow-rest supports the work close to the cutter to prevent chatter. Similarly, the cutter arbor is rigidly supported by an adjustable bearing with taper bushing.

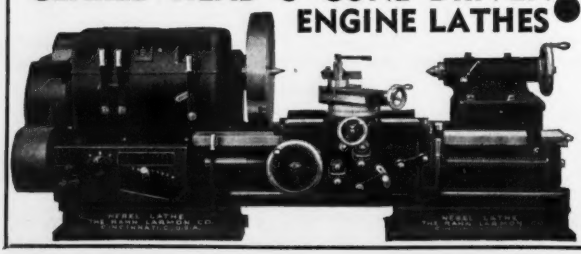
All drive shafts run at high speeds to insure maximum power, the final reduction being in the cutter head at the last stage. All shafts, including change gear studs, are multiple splines, and the gears in the main drive are hardened and form-ground. A range of 12 cutter speeds is provided, changes being effected by pick-off gears.

When hobbing, the rotation of the work head is derived from the cutter drive shaft through index gears, worm and index wheel. For spiral fluted work, a differential is inserted which is connected to the cutter slide feed. When thread milling by means of single indexing, the work drive is through change gears in the rear of the bed.

The cutter slide drive is transmitted from the work head drive through change gears located in the front of the bed. The feed is through a precision lead screw with square thread. The long bearing surfaces of the cutter head slide are guided by low prismatic ways and power quick return to the cutter slide is provided.

The cutter head can be swiveled in vertical plane by the worm and hand

GEARED HEAD & CONE DRIVEN ENGINE LATHES



Sizes 16" to 36" Swing

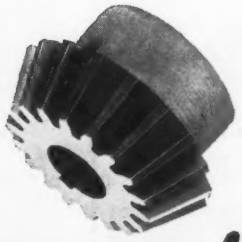
A full line of Gap Lathes, 16" to 50" swing.

Write for complete information

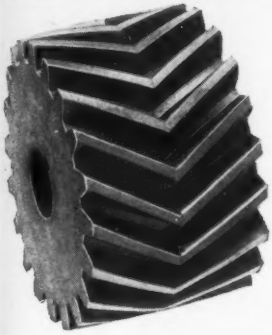
THE RAHN-LARMON COMPANY

CINCINNATI, OHIO

FORMICA GEARS



IMPROVE MACHINES!



They improve the silence and smoothness with which new machines operate so much that they are easier to sell; hence, the popularity of Formica gears with the sales departments of machinery manufacturers.

They improve old machines already in use so that the output is greater, labor turn-over, in times of scarcity, is lower, and the maintenance man is happier and has an easier life.

There has been a big lift in the use of Formica gears since business has come back, which has shown how greatly the popularity of these gears has grown in the past few years.

The next time you are in the market investigate Formica. You can get one or many gears promptly from the gear cutters named on this page.

THE FORMICA INSULATION CO.
4640 Spring Grove Ave. Cincinnati, Ohio

FORMICA
NON-METALLIC GEARS

FORMICA
Gear Cutters

The Akron Gear & Eng. Co., Akron, O.
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Slaysman & Company Baltimore, Md.
Harry A. Moore Bangor, Me.
The Union Gear & Mach. Co., Boston, Mass.
The Atlantic Gear Works New York City
Chicago Rawhide Mfg. Co. Chicago, Ill.
Perfection Gear Company Chicago, Ill.
The Mechanical Specialty Mfg. Co., Chicago, Ill.
Merkle-Korff Gear Co. Chicago, Ill.
Chicago Gear Company Chicago, Ill.
The Cincinnati Gear Co. Cincinnati, O.
The Horsburgh & Scott Co. Cleveland, O.
The Stahl Gear & Machine Co., Cleveland, O.
The Master Electric Co. Dayton, O.
The Adams Company Dubuque, Iowa
The Ferguson Gear Co. Gastonia, N. C.
Hartford Special Mach. Co. Hartford, Conn.
Beaty Machine Works Keokuk, Ia.
The Generating Gear Co. Milwaukee, Wis.
Badger State Gear Co. Milwaukee, Wis.
Precision Machine Co. Milwaukee, Wis.
E. A. Pynch Co. Minneapolis, Minn.
Joaquin Alemany Lopez Havana, Cuba
New Jersey Gear & Mfg. Co., Newark, N. J.
Prager, Inc. New Orleans, La.
J. Morrison Gilmour, 151 Lafayette St., New York City
Sier-Bath, Inc. New York City, N. Y.
E. M. Smith Machine Co. Peoria, Ill.
The Eagle Gear & Mch. Co. Philadelphia, Pa.
Rodney Davis and Sons Philadelphia, Pa.
The Pittsburgh Machine & Supply Co., Pittsburgh, Pa.
Standard Gear Co. Pittsburgh, Pa.
H. W. Honeyman & Son Providence, R. I.
Perkins Machine & Gear Co., Springfield, Mass.
Winfield H. Smith, Inc. Springville, N. Y.
Alling Lander Company Sodus, N. Y.
Charles E. Crofoot Gear Corp., South Easton, Mass.
Arlington Machine Co. St. Paul, Minn.
Farwell Mfg. Co. Toledo, O.
Diefendorf Gear Corp. Syracuse, N. Y.
Worcester Gear Works Worcester, Mass.
Massachusetts Gear & Tool Co., Woburn, Mass.

McCrosky

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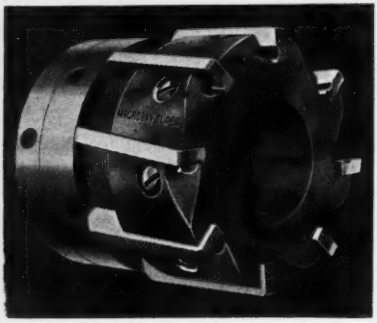
REAMERS



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- Quick adjustment reduces down-time for regrinding

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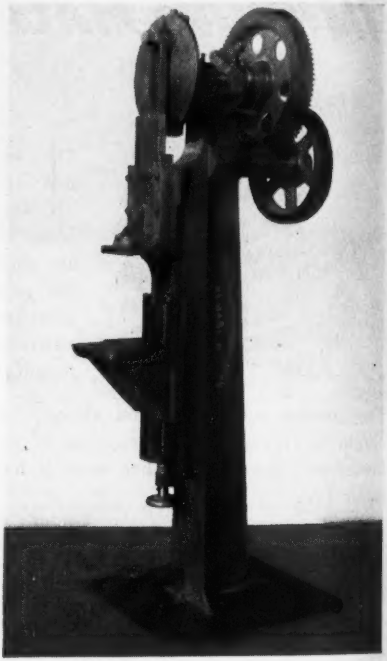
TOOL CORPORATION
MEADVILLE, PA.

wheel. Accurate angular setting is obtained by circular scale and vernier. A special cutter head for thread milling is optional instead of or in addition to the standard hobbing head.

Zeh & Hahnemann No. 4-1 Punching Press

The illustration shows the No. 4-1 punching press which has been brought out by Zeh & Hahnemann Co., 190 Vanderpool St., Newark, N. J., to meet the



Zeh & Hahnemann No. 4-1 Punching Press

demand for a press of comparatively light pressure but variable stroke, preferably up to 10 in. The table of the machine is made adjustable and in the lowest position, with a 10-in. stroke and the stroke down, has a die space of 8 in. The table can be adjusted to a maximum of 12 in. The distance from the center of the press to the edge of the frame is 5 in.: The bottom of the slide can be designed to satisfy any special requirements of the customer.

The press can be furnished either plain or geared, or arranged for indivi-

787
SIZES

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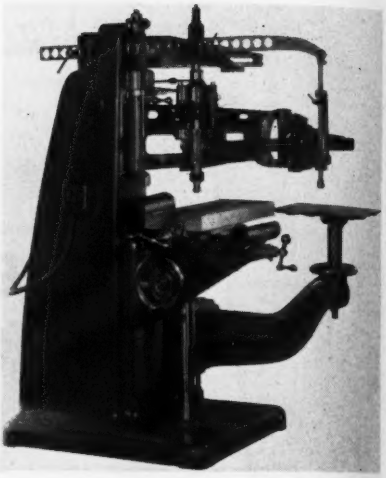
dual motor drive. The gear ratio is 1:6. The speed of the plain press is 100 r.p.m., the press operating with a 1 h.p. motor. Weight, 900 pounds.

Gorton Three-Dimensional Engraving Machines

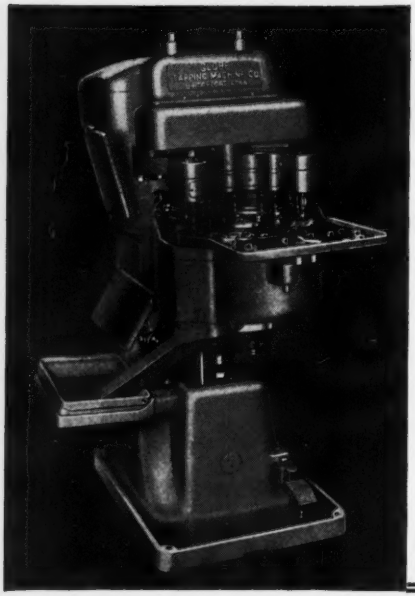
The George Gorton Machine Co., 1101 13th St., Racine, Wisconsin, has added 3-dimensional machines in two sizes to its line of Pantograph machines for engraving and die and mold cutting. These new 3-dimensional machines are adapted for cutting all kinds of dies and molds having ornamental designs, lettering, etc., such as die-casting dies, and glass, plastics and small rubber molds.

The Gorton line of die duplicators reproduce direct from an original in 1 to 1 ratio, not enlarging or reducing. These new pantograph machines supplement the Duplicator line, by reproducing in reduced ratio, direct from models of any shape or contour. This makes possible the production of dies in almost any desired size, from one model. These new machines will also do any of the work accomplished with older type Gorton 2-dimensional pantograph machines.

The new machines will reproduce from models of stone composition, bakelite, hard wood, etc., or from metal templates and master copies. Reproduction ratios range from one-half to one-eighth size of model or master. The machines possess several important advantages among



Front view of Gorton No. 3-L Pantograph Machine



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For all fast automatic drilling and tapping on large quantities of small parts.

Send us your samples or drawings for accurate time estimates and prices.

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KNURLED UNBRAKO

Socket Head Cap Screw

Every mechanic, when driving screws, will invariably use his fingers as much as possible, because they are much handier than any wrench and save time.

With the Knurled "Unbrako" he can drive much faster, as his fingers actually become geared to the Knurled Head so they can't slip.

Smooth Head Screws, hard to get hold of are much slower to drive.

The Knurled "Unbrako" is of exactly the same high quality as the smooth head "Unbrako",—

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Fingers become geared to the knurled "Unbrako" and therefore can't slip

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For gear assistance of every kind, we maintain Sales and Engineering Offices in all principal cities of the U. S. and Canada. You can draw upon the broad, practical experience of IXL men close to you.

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☐ Stoker Drives

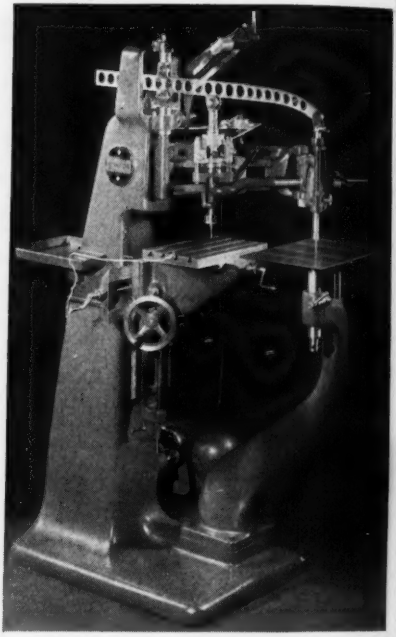
Name.....

Address.....

Company.....

which is that cutter spindle and tracer are always truly vertical with relation to work. Depth of cut can be obtained without causing an under-cut on one side of a deep mold.

Uniform pressure of tracer against model is maintained at all pantograph positions because the Gorton design eliminates the need for a counterweight to balance the pantograph. This construction also provides easier operation, because operator does not have to lift



Front view of Gorton No. 3-B Pantograph Machine

and hold pantograph against the thrust of cut in two directions. Gorton machines also provide larger work holding capacity and an unobstructed view of the cutter at all times.

The machines are accurately made for precision work, and have high speed spindles mounted on super-precision ball bearings. All pantograph joints are ball bearing, as are the motor drive parts. Table, saddle and knee are of a simplified, conventional milling machine type, with hand feeds. Machines are furnished complete with motor mounted and ready for operation.

CERROMATRIX

reduces die-making costs

A fast and accurate method of locating punches in relation to dies, without machining non-working surfaces to close dimensions. Saves from two to over two hundred hours on a single job. Secures dies and punches permanently for long as well as short runs. A matrix preferred by progressive die-makers for its exceptionally useful properties.

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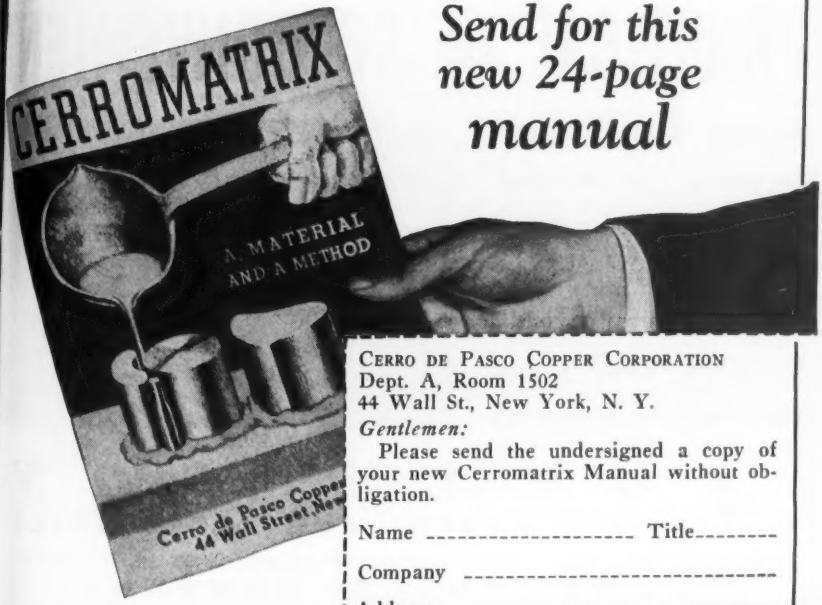

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Gentlemen:

Please send the undersigned a copy of your new Cerromatrix Manual without obligation.

Name ---------- Title----------

Company ----------

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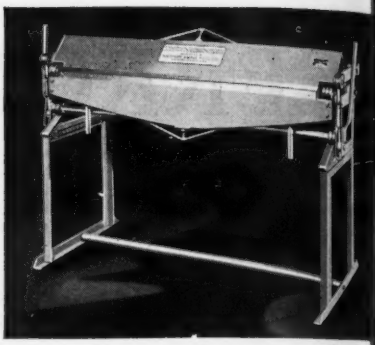
Materials used are only the very best. Castings are nickel semi-steel, normalized. Spindle parts are alloy steel, hardened and ground all over. Flat surfaces accurately hand scraped to surface plates, pulleys dynamic balanced. Chip guards, dust seals, etc., are provided throughout.

The 3-B (small size) will cut a maximum size cavity 6x12 in., and almost any depth, in one setting. Larger work can be reset. The 3-B takes cutters, to ¼ in. dia. with six spindle speeds, 3800-9900 r.p.m., driven by ¼ h.p. motor. Net weight is 850 lbs.

The 3-L (medium size) will cut a maximum size cavity 9x18 in. and almost any depth, in one setting. Larger work can be reset. The 3-L takes cutters to ⅜ in. dia., and has nine spindle speeds 1100-9200 r.p.m. driven by ½ h.p. motor. Net weight is 2100 lbs.

Whitney "Air Condition Special" Bending Brake

The machine shown in the illustration is the "Air Condition Special" Bending Brake which has been placed on the market by the Whitney Metal Tool Co., 91 Forbes St., Rockford, Ill. The brake



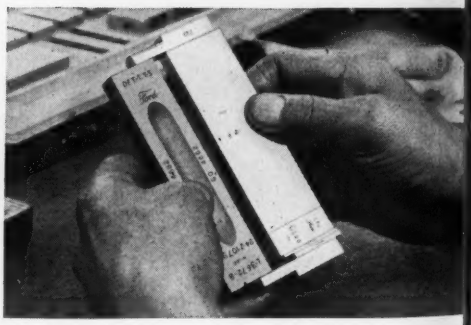
Whitney "Air Condition Special" Bending Brake

is light in weight, weighing only 26[illegible] pounds; thus two men can easily mov[illegible] the brake from job to job. The desig[illegible] and construction of the brake incorpor[illegible] ates some of the features previously used in Whitney-Jensen brakes.

The Air Condition Special Brake is [illegible] ft. 1 in. in length, and the capacity i[illegible] 20 gauge thick commercial iron such a[illegible]

PRACTICAL AND SO CONVENIENT

SELECT GAGE BLOCKS to form the desired length and wring them together with a set of jaws. Then you're ready to check—quickly and with precision accuracy.



JOHANSSON

GAGE BLOCKS AND ACCESSORIES

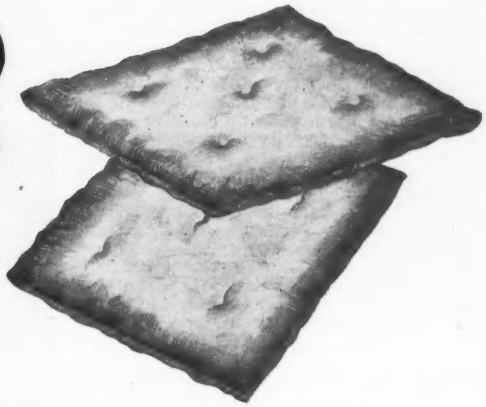
MANUFACTURED, SOLD AND SERVICED IN THE UNITED STATES AND CANADA BY

FORD MOTOR COMPANY

JOHANSSON DIVISION **DEARBORN, MICHIGAN**

GOOD for crackers

BAD for taps



HEAT applied to crackers or taps makes their thin edges BURN.

On crackers, crisp edges are appetizing, but . . . burned edges on tap teeth are brittle and distorted.

Bath engineers have completely eliminated brittleness, chipping, and distortion, by grinding the teeth from the solid blank **AFTER** it has been properly hardened. Rockwell testing shows that the thinnest edges of the teeth then have the same perfect grain structure as the core itself, and the results are . . .

- **Longer life between grinds**
- **More positive cutting**
- **Extreme accuracy**
- **Greater savings**

The super finish of the teeth . . . highly polished flutes . . . lapped centers . . . and the file hard taps, all insure the tremendous productive capacity of BATH TAPS.

Let us make a survey of your tapping problems. No obligation for this chance to save on your tapping.

John Bath & Company Inc.

WORCESTER, MASS.

is used in air conditioning work. Turnbuckles provide a means for rapid adjustment for variations in thickness of materials, and a graduated scale at the hinge lugs aids in duplicating. The scale is made of steel hinge pins, liberal in size and hardened and ground to assure accuracy, rigidity and long wear.

The upper jaw of the brake is of box-type welded construction, and the lower jaw has welded reinforcements with a 1-in. projection for offset work of structural shape. The bending leaf has angle iron welded underneath crotchwise, making it very sturdy. The three members are provided with truss rods for further adjustments. The brake is available in two styles; floor or bench type.

Thor One-Hand Portable Electric Screw Driver

A portable electric screw driver of unusually small size and light weight, capable of driving all sizes of screws from No. 4 to No. 12 by simply changing the finder and bit, has been announced by the Independent Pneumatic Tool Co., 610 W. Jackson Blvd., Chicago, Ill. This electric screw driver—to be known as the Thor No. U-16—is designed along the lines of the No. U-14 electric drill recently announced, which was the smallest electric drill ever built.

All weight is concentrated at the operator's hand, eliminating overhanging weight and providing easy, untiring operation, with "finger-point" accuracy.

Thor U-16 One-Hand Portable Electric Screw Driver

Only 10½ in. overall length, the screw driver can be used in places ordinarily inaccessible. A powerful motor, dependable tension adjustment, hand wound armature and special commutator construction provide efficient operation.

High grade ball bearings and accu-

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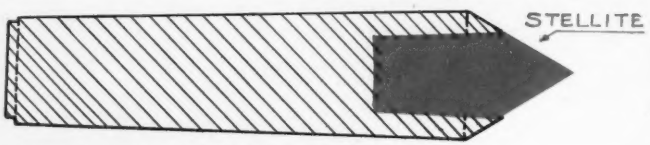

No. 1 MORSE TAPER STELLITE CENTER	$1.75
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No. 5 MORSE TAPER STELLITE CENTER	9.25

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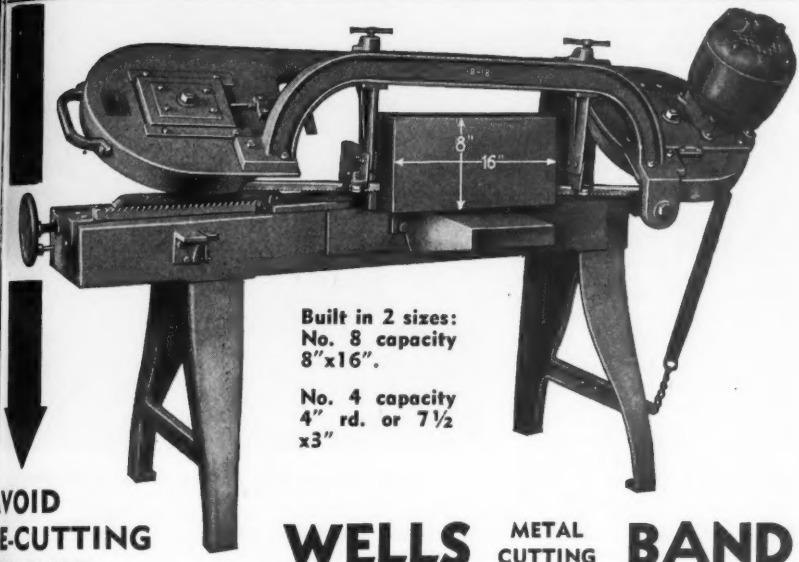

Built in 2 sizes:
No. 8 capacity 8"x16".

No. 4 capacity 4" rd. or 7½ x3"

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WELLS METAL CUTTING BAND SAW

Cuts hundreds of duplicate pieces without showing a variation of .005" in thickness.

Cuts all kinds of metal—hot or cold rolled machine steel, carbon tool steel, monel metal and alloys—with unerring accuracy in any shape at any angle. It will handle any metal—thick or thin, sheet, rod or tubing, up to the limits of its generous capacity. Cuts time and costs 30 to 50%.

Make the Wells Band Saw your tool for getting full capacity production at the lowest possible metal-cutting cost.

Send for the descriptive folder today.

THE WELLS MANUFACTURING CORPORATION
THREE RIVERS MICHIGAN

rately machined heat treated helical gears reduce noise and vibration to the absolute minimum and increase motor efficiency to the maximum. The motor is cooled effectively by a patented ventilating system, thus power is increased and the motor is enabled to pull a substantial load without overheating. The free speed of the motor is 700 r.p.m. Weight complete with screw driving attachment, 3½ pounds.

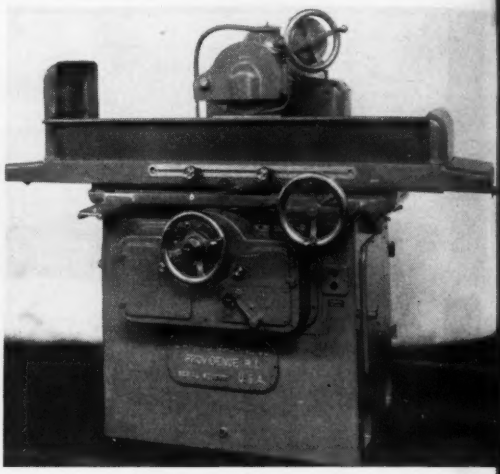
Diamond Type G-824 Surface Grinding Machine

The Diamond Type G-824 Surface Grinding Machine illustrated herewith has been brought out by the Diamond Machine Company, 7 Codding St., Providence, R. I. The machine is designed in accordance with high standards of present day machine tools and is said to be especially well suited for both production and tool room requirements.

The Type G-824 is equipped with hydraulic longitudinal and cross feeds, the longitudinal feeds being variable from 10 to 100 ft. per minute, instantaneous control being afforded through a single speed control lever. The hydraulic cross feed has a range of from 0 to 0.125 in. at the end of each stroke. Provision is made for conveniently and quickly disconnecting the piston mechanism when sensitive hand operation of the table is desired.

The spindle of the machine is hardened and ground. It is provided at the front with a tapered bronze bearing having positive end thrust and adjustment for radial and longitudinal wear so that the wheel position is accurately held, and is provided at the rear with a floating radial ball bearing. The wheels are mounted on a demountable wheel sleeve.

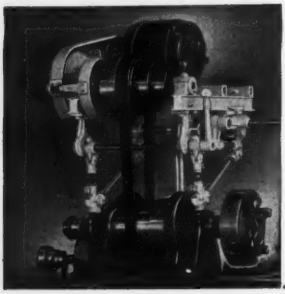
The machine is arranged for wet



Diamond Type G824 Surface Grinding Machine

grinding with water pump, removable sediment pump and main tank self-contained within the bed. Safety lock with interlock between hand and power feeds are provided so that hand and power longitudinal feeds cannot be engaged simultaneously. Overtravel is also provided.

The machine has capacity for grinding 8 in. wide, 24 in. long, 9 in. high, 10 in. diameter, and is equipped with ¾-in. face abrasive wheel. Table travel is sufficient so that the wheel clears the table platen on all four sides. The machine is powered by two 1½ h.p. 180



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Complete rigidity—no overhang—no strain on beds, frames, etc. Universal motor mounting—use any motor—not built special, change from one tool to another if desired. V Belt or Chain from motor. Complete guards—quick belt adjustment.

Complete line of Drives from Hack Saws to 42" Lathes, etc.—Quickly applied.

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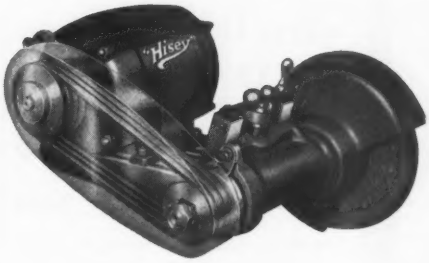
MANLEY PRODUCTS CORPORATION

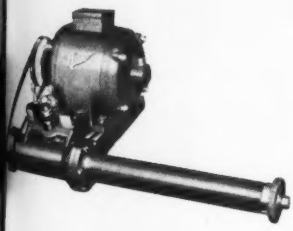
YORK, PENNSYLVANIA

PATENT Nº 1953133

puts "HISEY" in a class by itself



AT RIGHT — A 3 H.P. Wide Range Precision Grinder with EXTERNAL Grinding Head. Also made in nine other sizes from ¼ to 10 H.P. capacity. Extra Interchangeable Internal Grinding Heads can be furnished as shown below.



AT LEFT — A 1 H.P. Wide Range Precision Grinder shown with INTERNAL Grinding Head. There is a wide selection of Internal Grinding Heads available of various lengths as well as for very small to large diameter holes.

NY machine which meets with such acceptance as the "HISEY" Wide Range Precision Grinder is bound to be copied. While such copies may appear to be just the same or just as good, Patent No. 1953133 of April 3rd, 1934, precludes the possibility of any Grinder offering all the features and advantages of the "HISEY" Wide Range Precision inder without infringement.

rthermore, the years of development and experimental work have afforded invaluable experie in the building of precision spindles which can not be gained overnight even in an attempt make an exact copy. For obvious reasons the tools and fixtures developed to build these cision spindles have never been patented and care has been exercised to prevent their plication.

ISEY" Wide Range Precision Grinders are built in External, Internal and Combination pes for use in connection with lathe, planer, boring mill, etc., for tool-room and production rk such as the grinding of rolls, surface plates, bearings, journals, mandrels, cutters and thousand and one odd grinding jobs which crop up in every shop and tool-room.

ere is a large range of types and sizes from ¼ to 10 H.P. to meet most every demand. great variety of interchangeable internal and external spindles are also available.

Catalog 47-M giving full details sent on request.

THE HISEY-WOLF MACHINE CO.

"It's High Grade If Hisey Made"

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Established 1896
CINCINNATI, OHIO, U.S.A.

Electric DRILLS . . . GRINDERS . . . BUFFERS

★WHEN

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should interest you

● Heat treatment is vitally important in cutter manufacture. Vincent operates one of the oldest and largest commercial heat treating plants in the country and has vast experience in this line. The "Vincent Process", a special heat treating formula used on all our cutters, is one of the secrets of their amazing durability.

Every VINCENT Cutter Has 18 Teeth *Count Them!*

● All Vincent cutters are MILLED, not stamped, from specially selected steel. An immense aid to longer life.

● Every Vincent cutter has 18 teeth, thus assuring maximum efficiency.

● Vincent is one of the pioneer cutter manufacturers, and Vincent cutters, because they outwear and outperform all others, are standard in many of the world's largest industrial plants.

Specify "VINCENT" on your next order for grinding wheel tools and you will get the best at no extra cost.

The Vincent Steel Process Co.

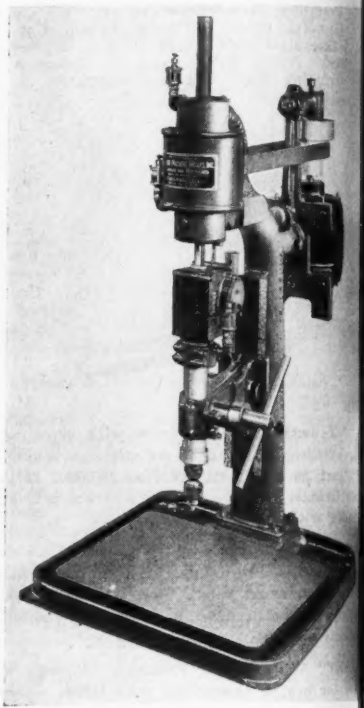
2434 Bellevue Ave.

Detroit, Mich.

r.p.m. motors, one driving the ma spindle at constant speed, the oth driving the hydraulic mechanism.

Onsrud Type No. S-76 Lapping Machine

To meet the need for a machine wi which lapping operations can be a curately and economically performed all types of small work, the Onsrud M



Onsrud Type No. S-76 Lapping Machi

chine Works, Inc., 3900 Palmer St., Ch cago, Ill., has brought out the Type 76 machine shown in the illustration.

This machine operates on the prin ple of a drill press with the excepti that a reciprocating movement is i parted to the spindle. The reciproc tion is adjustable from 0 to 5/16 and is in positive relation to the ro tion of the spindle, power being tra mitted to the reciprocating arm means of a hardened and ground wo

NEW USEFULNESS
NEW ECONOMY
NEW SPEEDS

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MILLING MACHINES

with the

DALRAE SPEEDMILL *for*

SMALL END-MILL OPERATIONS

Sturdy, high quality, precision construction of the DALRAE SPEEDMILL provides ample strength and rigidity for continuous operation at high speeds for indefinite periods. The attachment is balanced, perfectly safe and weighs only 71 lbs. for the 1/3 H.P. model. One man can mount it in 56 seconds. Quick and easy to change to any of the . . .

6 SPEEDS — 350 TO 4000 R. P. M.

Cut costs . . . get better work on your end-mill operations with a DALRAE SPEEDMILL . . . "It's a distinct necessity and a real money saver in any shop."

Catalog giving full facts and suggestions for uses sent promptly on request.

THE DALRAE TOOLS COMPANY

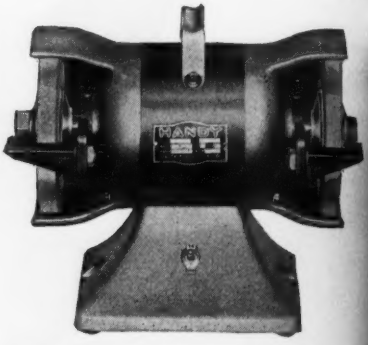
SYRACUSE BLDG. SYRACUSE, N. Y.

and bronze gear. Three spindle speeds and three relative rates of spindle reciprocation are available, the speeds being controlled through a bearing of three step cone pulleys. The driving motor is applied directly to the motor shaft, the shaft running in bronze bushings which are arranged with take-up for wear. The gears are encased and packed with grease, and the spindle is equipped with a set of sight feed lubricators. A Jacobs chuck adjustable to ⅜ in. is standard equipment.

Spindle speeds are 5000 r.p.m., 2200 r.p.m. and 1000 r.p.m., and the spindle can be adjusted to oscillate at 250, 110 or 50 strokes per minute The driving motor is ½ h.p., 1800 r.p.m., either a.c. or d.c. Height overall is 43 in., size of table is 20x23 in., and the weight is 290 pounds.

Baldor 6-In. Ball Bearing Bench Grinder

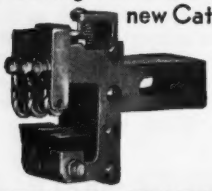
The Baldor Electric Co., 4357 Duncan Ave., St. Louis, Mo., announces the development of a 6-in. ball bearing bench grinder. According to the manufacturer, this new product has various advanced features, such as ball bearings, adjustable tool rests, and attractive finish, but the principal talking point of this grinder is that it is powered with a capacitator motor. The motor has no commutator, no brushes, no switch, and the omission of these parts coupled with the fact that the motor will not burn out under overload, makes the unit particularly trouble-free.



Baldor 6-In. Ball Bearing Bench Grinder

Check into these MODERN PRODUCTS

It will pay you well to check up on these Modern Products. Many other Money Saving Items are described in our new Catalog. Write for it.

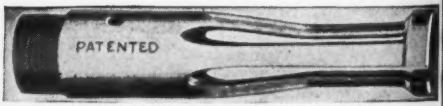


"SHAVERITE" SHAVING TOOL

Dove-tail slide with adjustable gib eliminates all play. So accurate that it often replaces grinding. Can also be used for light forming operations.

SPRING COLLETS

Made of special steel, and have a hard long wearing surface with a tough springy core. Guaranteed accurate in design with taper ground true to hole. Deeply corrugated to give a positive grip. Smooth collets furnished at regular price if desired. Special shapes furnished to concerns submitting blue prints. Superior gripping surface makes locking fingers and shoes last longer.



"MODERN" FEED FINGERS

are universally used. The same feeder can be used for either hex or round stock, or round and square.

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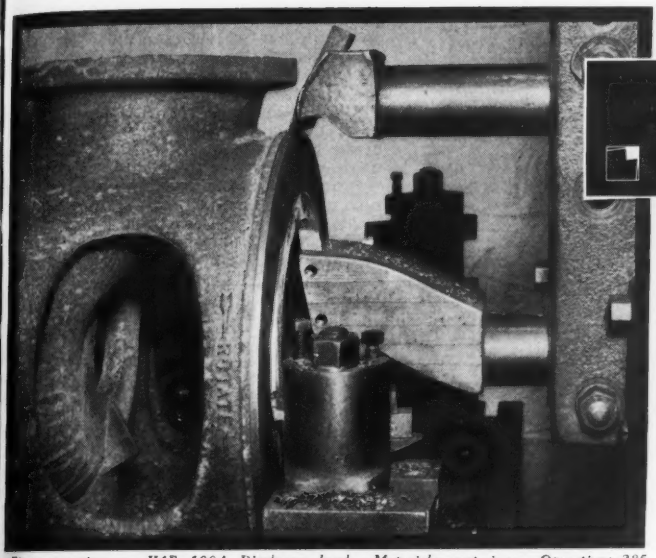
Continental Bench Model "Do-All" Band Sawing and Filing Machine

Three machines have been incorporated into one in the design of the bench model "Do-All" band sawing and filing machine which has been brought out by Continental Machine Specialties, Inc.,

Continental Bench Model "Do-All" Band Sawing and Filing Machine

1301 S. Washington Ave., Minneapolis, Minn. The machine is powered by a 1/3 h.p. motor with integral geared head reduction unit, and operates at the single speed of 140 ft. per minute. The machine uses the narrow special saw blade which is characteristic of the "Do-All" machine, the blades being available in widths of ⅛, 3/32 and 3/16 in. The bench model uses the same file bands, the same emery cloth bands, and the same saws that are used in the heavy duty model.

The machine has a 12-in. throat and



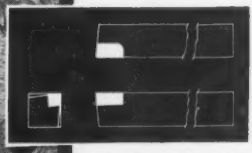


Diagram of Vascoloy-Ramet tool Grade A for use on cast iron, bronze, brass, aluminum and semi-steel. Shank size: ¾"x¾" x4". Tip size: ¼"x 5/16" x ⅝". Three of these tools were used simultaneously in this operation.

First operation on H4E 100A Discharge head. Material: cast iron. Operations: 285 F. P. M. 7/32" roughing cut and 1/32" finishing cut. Facing, 15¼" to 9¼". Constant turning 15¼" O.D., feed .040; Boring 9¼" I.D., feed .040.

Comparative performance of VASCOLOY-RAMET tools.

	Cutting time	Pieces Per Grind
VASCOLOY-RAMET	4 minutes	150
Previous performance	8 to 10 minutes	4 to 20

Again, the superiority of Vascoloy-Ramet, the new tantalum carbide hard alloy, is translated in terms of time and dollars saved.

A complete order, 150 pieces, finished in one grind! No changing of tools, no regrinding, no mounting costs on close jobs when time means everything!

Vascoloy-Ramet covers a wider range of uses than any other tool material. Unrivaled in the machining of all steels, it stands alone as the only material capable of turning steel without "cratering", and also excels in performance on cast iron, semi-steel, and non-ferrous materials.

Its revolutionary economies already have given it a dominant place both in small shops and in the country's greatest plants.

The new Vascoloy-Ramet catalog price-list will be gladly sent upon request.

VANADIUM-ALLOYS STEEL CO.
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Showing class of work that can be handled on Continental Do-All Machine.

will take work up to a maximum capacity of 6 in. The one-piece frame is amply rigid for the 6-in. thickness.

Instead of the "Do-All" automatic electric brazer which is standard equipment on the larger machine, the bench model is equipped with a saw brazing jig which is mounted on the frame of the machine. This jig is not electric, the braze being made with a blow torch or other external source. However, a braze can be completed within 10 minutes with the unit provided.

Standard equipment includes a 1/ h.p. geared head motor, four assorted band saws, one file band, one box silver solder, one jar borax flux, and one non-electric saw clamp and filing jig.

"Zip-Lift" Electric Hoist

An entirely new line of electric hoists known as the "Zip-Lifts" with capacity ratings from 250 to 500 pounds, is announced by the Harnischfeger Corporation of Milwaukee.

Designed primarily for "spot handling" work in machine shops, welderies, storage booths, foundries, etc., these units are of all welded construction and are exceptionally light; the quarter-ton model weighing only 100 pounds. With a ball bearing motor especially designed for hoisting service and smooth operation through a simplified planetary gear train which is fully enclosed and run-

NEW! MODERN!

$82.50 COMPLETE AS SHOWN LESS MOTOR

Atlas ★ METAL WORKING LATHES

The new Atlas lathes were designed and built to give more value—accuracy—efficiency and satisfaction than ever before during the 25 years Atlas has been building precision shop equipment. The back-geared model shown has 36" bed, 10¼" swing, and takes 19" between centers. Accurate to .001" for those precision jobs in manufacturing, tool room, or laboratory. Can be fitted with attachments for all machine shop operations.

Other new Atlas metal lathes priced from $35.50 up. Sold on monthly payments if desired. 2 weeks trial. Money back guarantee. Send for latest catalog of metal and wood working lathes, drill presses, tools, and attachments — illustrating today's outstanding equipment values.

Self-contained countershaft and universal motor bracket. Threading range 4 to 96 per inch. 16 speeds 28 to 2072 R.P.M. Automatic reversible power feeds. Threading dial. Graduated tailstock ram. Modern V-Belt drive. New heavy cast iron gear guard. Threading chart. Laminated shims throughout. Heavy, new design compound rest. Well and pin for center lubricant.

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GEARS—Special alloy steels, helically cut for quiet operation.

FRAME—Die-cast for strength and lighter weight.

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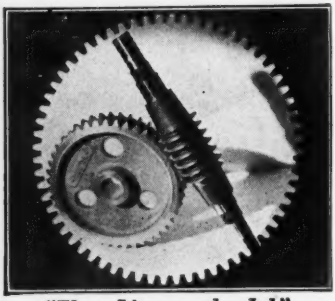

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● For boring and turning all non-ferrous metals, bakelite, hard rubber, etc. Strong and keen cutting. Guaranteed to perform satisfactorily.

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ning in oil, the "Zip-Lifts" have hoisting speeds up to 32 feet per minute and are controlled either by push button or pendant rope. To simplify installations, all complicated wiring has been eliminated so that for hook, trolley or jib crane service they need only be hooked up and plugged in like the average electric appliance.

Positive safety is assured with weight-

Zip-Lift Electric Hoist

type limit switch, solenoid dry disc motor brake and ratchet and roller type mechanical brake. Standard units are furnished with or without trolley.

Dreses Multi-Duty Horizontal Drilling and Milling Machine

Dreses Machine Tool Company, Cincinnati, Ohio, has augmented its line by the addition of a Stationary Table Type Horizontal Drilling and Milling Machine. The machine consists of a stationary table, head which is fully counterbalanced, column and column runway. It

WE DON'T CLAIM
TO KNOW-IT-ALL
-but in 7 out of 10 plants that assemble metal or plastics we CAN help shop men find new economies.
Parker-Kalon Assembly Engineers
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MOST shop men know and make some use of Self-tapping Screws . . . yet in 7 out of 10 cases they can profitably employ the *specialized knowledge* of a Parker-Kalon Assembly Engineer. By a simple investigation of fastenings he uncovers opportunities for further cost reduction, design simplification and product improvement . . . benefits that can be obtained without added expense simply through making the fullest practicable use of Self-tapping Screws.

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It will cost you nothing to have such a study made by one of these Specialists. All have the practical experience necessary to understand your problems. All are too busy to "pester" you. Their function is service . . . they do no selling. A letter of invitation will put your plant on the schedule of our nearest Assembly Engineer.

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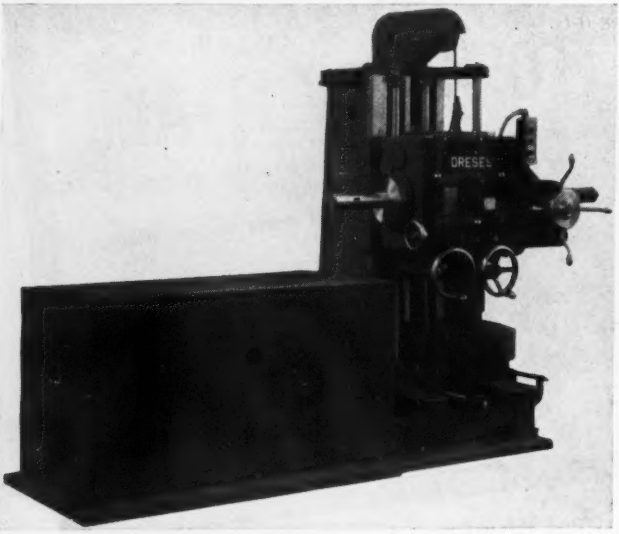
PARKER-KALON *Modern* FASTENING DEVICES

A HARDENED SELF-TAPPING SCREW FOR EVERY KIND OF ASSEMBLY

can be furnished in various table sizes combined with various vertical travels of the spindle head and various travels of the column on the runway.

Vernier scales reading to 0.001 in. are furnished as standard equipment but a precision dial and rod-measuring device can be furnished for the head and for the column. Drive is furnished by a reversible motor of 3 to 5 h.p. and control for either a.c. or d.c. current.

The spindle head is fully counterbalanced and the sheaves operate on anti-friction bearings. The head contains the entire driving mechanism for the spindle, the feed-change unit for the drilling and boring feeds to the spindle, and milling feeds to the head and column, the latter being obtained through extra-large single pitch screws with corresponding nuts of the revolving type.



Dreses Multi-Duty Horizontal Drilling and Milling Machine

Drilling and boring feeds to the spindle are through a multiple disc friction clutch and worm end wheel driving to a rack cut from the solid alloy steel spindle feeding quill.

For the operation of the clutch it is only necessary to throw one of four handles. The spindle is hardened and slides in hardened bushings in the alloy steel driving sleeve, the sleeve revolving in Timken Zero Precision Tapered Roller Bearings. The face plate gear is a herringbone gear 12 in. in diameter. The entire twelve-speed mechanism consists of hardened sliding gears, sliding on alloy steel heat-treated shafts, with multiple splines. Driving gears are of the helical-bevel type.

The feed mechanism is driven directly from the spindle; thus all of the eight feeds can be applied to each spindle speed. All feeds are reversible, including the feed to the spindle, head and column. A series of three hand-wheels together with dials reading to 0.001 in. are furnished for the hand feed to the spin-

THE ONLY BORING HEAD MADE WITH 4" RANGE

COST LESS: One head covers range up to 15".
LAST LONGER: Rugged construction insures long life under trying conditions.
WIDER RANGE: Has movement in thousandths of from 0 to 4".
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For further information and prices, write:

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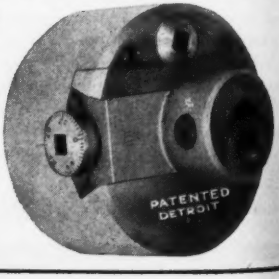

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Quick Change

Compensates automatically for misalignment between machine spindle and the work.

Taps produce thread with uniform pitch diameters.

Reamers finish holes true to size.

Prevents taps and reamers from breaking and eliminates bell mouthed and oversize holes.

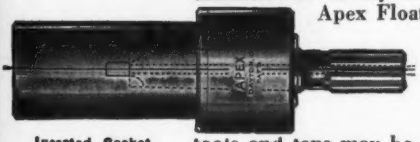
Used by hundreds of manufacturing companies whose repeat orders are proof that Apex Floating Holders reduce costs and tool breakage.

Write for catalog No. 8 for full information.

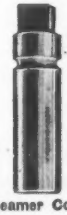
Tap Collet

Sockets are furnished for Morse Taper or straight shank tools. Shanks can be furnished in any Morse Taper or straight diameters to fit any machine spindle.

Apex Floating Holders are also furnished with Quick Change bottoms so that collets for Morse Taper, straight shank tools and taps may be quickly changed.



Inserted Socket Type for Screw Machine Use



Reamer Collet

Through purchase of the Schellenbach-Hunt Tool Company, Cincinnati, Ohio, we manufacture a full line of Apex S & H adjustable machine and shell reamers, expansion reamers and special line reamers.

THE APEX MACHINE & TOOL CO.

THIRD AND MADISON STREETS, DAYTON, OHIO

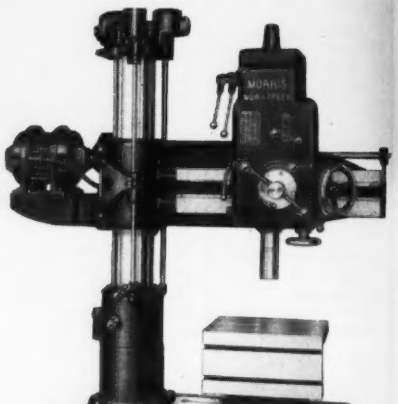
dle, to the head and to the column. The entire control of the machine is located on the head. It is impossible for two speeds or two feeds or the feeds to the head, column or spindle to be thrown in at one time.

The column is a box-shaped casting, strongly ribbed and of sufficient size to contain the counterweight for the head. The bearing on the runway is 43 in. long and the width of the column face for the head is 18 in. The runway is a box-shaped casting, heavily ribbed, 30 in. wide by 12 in. deep. It is bolted, doweled and keyed to the table. The table is box-shaped and contains the tank for the coolant system. The coolant pump and electric motor are mounted on the table at the rear of the machine.

The spindle feed is continuous 18 in. Vertical travel of spindle head, 24 in. Horizontal travel of column, 24 in. Number of spindle speeds, 12. Range of spindle speeds, 15 to 500 or 30 to 1000 r.p.m. Number of feeds, 8, from 0.002 to 0.120 in. Range of milling feeds to head and column, 0.005 to 0.220 in. Size of table, 30x60 inches.

Morris "Mor-Speed" Radial Drill

Rigidity, convenience, power, and simplicity of operation are features of the Morris "Mor-Speed" Radial Drill, now being offered by The Morris Machine Tool Co., Cincinnati, Ohio. With centralized control, every operating lever is within easy reach of the operator's normal position.



Morris "Mor-Speed" Radial Drill

The head contains all the speed and feed change mechanism, with every part automatically lubricated. A constant flow of oil is assured at all times. Speed and feed changes are made through selective sliding gears on fixed centers, only the driving gears being in mesh. Gears are broached to fit splined shafts, and the teeth are ground, insuring smooth, quiet operation. All gears, shafts, spindle and spindle sleeve are of alloy steel, hardened. All other parts are heat treated.

The head is mounted on ball bear-

IDEAL SPEED LATHES

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2 Speed Motor. Automatic Brake. Collet or 3 Jaw Chucks. Hand operated or automatic. Write for Cir. 351.

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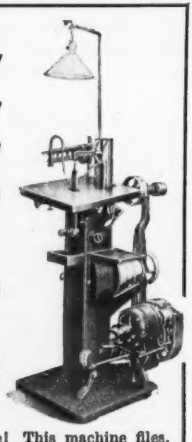
File your dies, gauges, etc., in half the ordinary time with an

"OLIVER"
(Rearwin Patent)
DIE FILER



Save your diemaker's time! This machine files, saws, trims templates, patterns, jigs, etc. better and in one-half to one-fifth the time required by hand method. Handles closed bottom and closed top dies. Has wide range of adjustments. Takes any size file.

Ask for full details

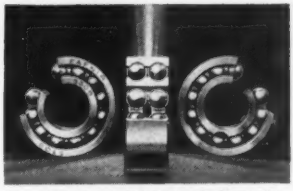
OLIVER MACHINERY COMPANY
GRAND RAPIDS, MICHIGAN, U. S. A.

away power and maintenance costs

That's what the row upon row of standard oscillating grinding machines at the Fafnir plant are doing. They represent the approved method for obtaining the spherical raceways of ball bearing rings — but with a multitude of improvements designed into these machines by Fafnir's own engineers that assures uniformity of rings and balls to dimensional tolerances in the tenths of thousandths of an inch. The fact that Fafnir is never entirely satisfied with "standard practice" accounts in no small measure for the inherent quality of these ball bearings.

Such small details in the manufacture do not at first distinguish these bearings from any one of a dozen other makes. But six months after the installation of Fafnirs the bigger dividends paid by these quality bearings may be quite apparent—dividends in the form of continued accuracy of alignment, of new machine efficiency and the negligible maintenance attention required.

Whatever the duty . . . there is a Fafnir Ball Bearing that fills the requirements exactly. Fafnir engineers are at your service, too, with a quarter-century of experience, to assist you in getting the utmost from ball bearings. . . . The Fafnir Bearing Company, *New Britain, Conn.* Atlanta . . . Chicago . . . Cleveland . . . Dallas . . . Detroit . . . Kansas City, Mo. . . . Milwaukee . . . Minneapolis . . . New York . . . Philadelphia.



Race grinding is one of the 77 steps in the manufacture of a Fafnir Ball Bearing, of which this Double Row Bearing is a representative type.

FAFNIR

BALL BEARINGS

ings, providing effortless movement of the head on the arm. The arm is also mounted on ball bearings so that it will swing easily. The spindle is mounted in anti-friction bearings, in a sleeve of generous size. The spindle drive gears are above the sleeve, and the sleeve travels with the spindle, providing support to stiffen the spindle at the working end.

The arm elevating and lowering mechanism is a separate motor-driven unit operated through a lever at the bottom of the column. The unit runs in oil. Hand elevation is available if required. Clamping of the head and column is accomplished by the use of an eccentric, operated by hand levers. The coolant system is fed by a motor-driven pump, providing volume without pressure.

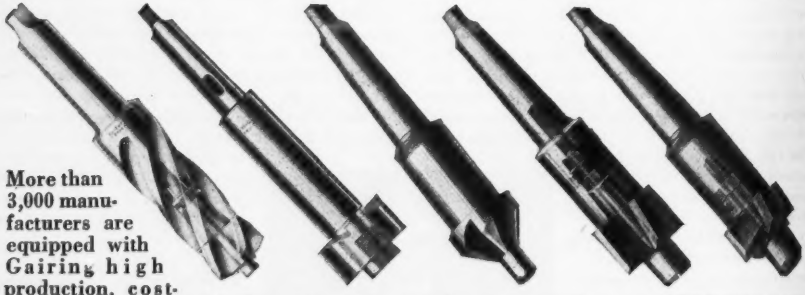
The spindle is perfectly counterweighted and is instantly reversed by the use of a small lever at the lower right of the head, assuring high speed tapping.

The drive consists of a constant speed reversing motor, mounted on the rear of the arm to balance the machine and avoid moving the motor with the head. The motor is connected to the arm shaft through a pinion and drive gear. The reversing switch is built into the head at the lower right hand corner, and the machine is instantly started by bringing the lever down. Bringing the lever up reverses the spindle. Center position is neutral and stops the entire machine. The machine is built with 9-in. column, and is available in either 3-ft. or 4-ft. size, either for light or heavy duty. Floor space required for the 3-ft. machine including motor arm extension is 31x82 in. For the 4-ft. machine, 31x94 in. Approximate weights, respectively, 4800 and 5200 pounds.

Worcester Combination Cutter, Reamer, and Drill Grinder

Wm. Halpern & Co., 53 Park Place, New York, N. Y., is now marketing a tool grinder developed by the Worcester Polytechnic Institute, to be known as the Worcester Combination Cutter, Reamer and Drill Grinder. The features of the machine are the simplicity of design, speed in setting up, ease of operation, and accuracy. The machine is intended for the sharpening of milling and forming cutters, helical, side and formed milling cutters, single and double angular cutters, convex and concave cutters, special purpose cutters, end mills,

GAIRING COST-SAVING TOOLS



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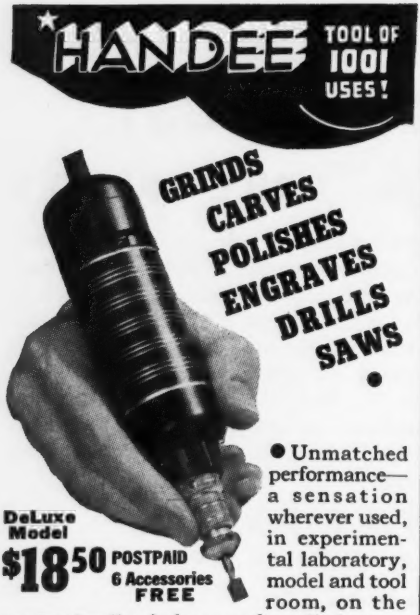

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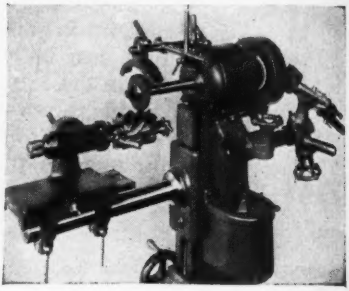
shell, hand, or taper reamers, and two, three, or four lip drills.

The vertical adjustment is easily made by means of a hand wheel and screw operating through a ball thrust bearing. In grinding cutters the horizontal travels obtained by sliding the arbor on which the cutter is mounted in its bearing. The drill holder has the special feature of variable clearance, which permits grinding the drill to conform to the feed. The angle at the point of the drill can also be varied to suit the material. It is said that the machine will correctly grind twist drills, flat or chucking drills, two, three, or four lip drills



Worcester Combination Cutter, Reamer, and Drill Grinder

or flat twisted drills without removing them from their sockets, and will accommodate drills with shanks larger than the body of the drill itself. The lip rest is reversible and adjustable but requires no adjustment if the drill is of standard make.

The reamer grinding attachment is furnished as an extra, and the machine may be purchased without the drill grinding attachment. Taper holes in arbors as regularly furnished are for No. 2, No. 3 or No. 4 Morse Tapers. No. 6 and No. 8 Brown and Sharpe Tapers will be furnished if desired.

The machine will grind face and side milling cutters up to 10 in. diameter, angle and plain milling cutters up to 10 in. diameter, and gear cutters and hobs up to 10 in. diameter. By using a raising block, these capacities can be increased by one-half. Reamers, either straight or tapered, up to 17 in. over all can be ground. Drills from No. 52 to 1¼ in. can be ground.

The table has a longitudinal movement of 13 in. and a vertical movement of 5 in. The centers will swing work up to 5 in. diameter and 70 in. long. The height to the center of the spindle

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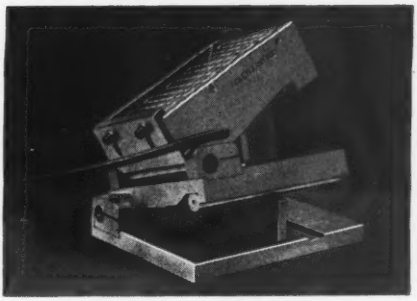

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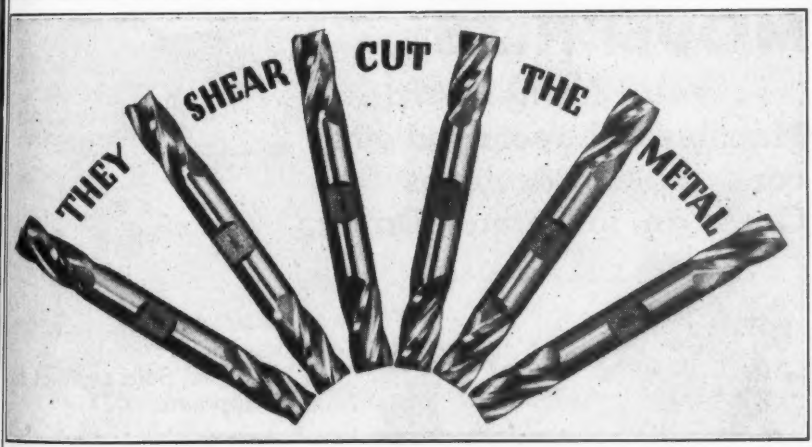

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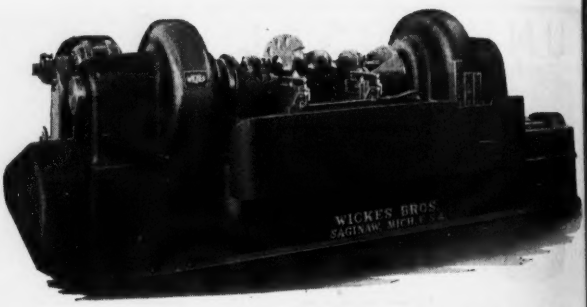
is 42 in., but this can be increased. Motor speed, 3600 r.p.m. Floor space required, 42x43 in. Net weight, 250 pounds.

Wickes Model DA-8 Automatic Duplex Type Crankshaft Lathe



Wickes Bros. Model DA-8 Automatic Duplex Type Crankshaft Lathe Set Up for Cheeking, Turning and Filleting Nos. 1 and 4 Pins on a Diesel Crankshaft.

Wickes Bros., Saginaw, Michigan, have developed an extra heavy duty machine especially designed for the machining of heavy Diesel type and heavy tractor type crankshafts. The work cycle of the lathe is entirely automatic, the following operations being performed in their proper sequence: rapid traverse of tools, to cutting position; coarse cheeking feed; fine turning feed dwell (in which the cutting tools are held in a definite position for five or six revolutions of the shaft to clean up the cut); diameter stop; rapid traverse of tools to unloading position; stop in unloading position.

After the crankshaft has been chucked in the machine it is only necessary to press the electrical start button to start the machine, which automatically goes through the entire work cycle.

Most of the bearings throughout the machine are of the anti-friction type; the main spindle bearings are, however,

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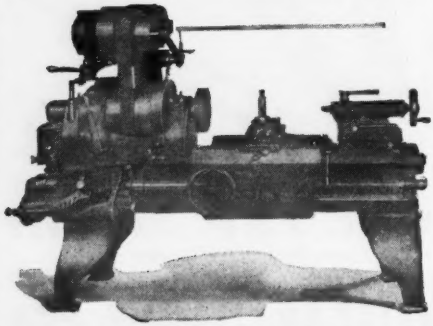

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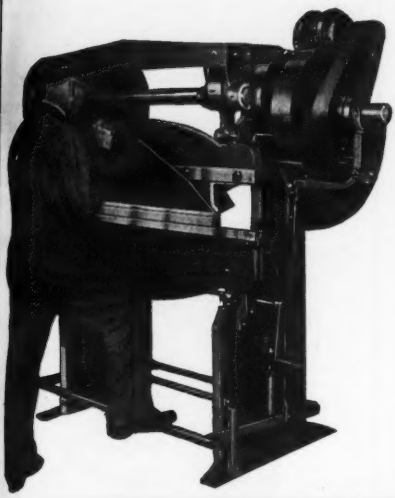

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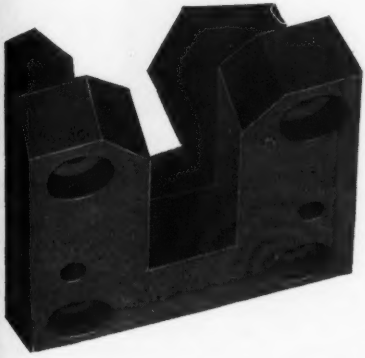

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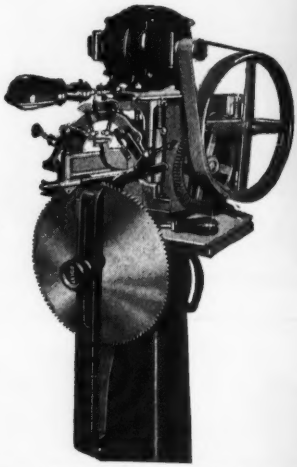
bronze boxes lined with genuine babbit Forced feed lubrication is provided throughout the machine. The lathe is driven by a 20 h.p.h variable speed d.c. motor through multiple Vee belts. The net weight of the machine, with electrical equipment, is 28,000 lbs.

Foley Automatic Saw Filer

Any type of saw can be filed on the Foley Automatic Saw Filer, according to the manufacturer—the Foley Manufacturing Co., Inc., 13 Main St. N.W., Minneapolis, Minn. Among these are any type of circular cross-cut saw that can



Foley Model F-16 Automatic Saw Filer

be filed with a three-cornered file, band saw, and hand saw. The machine automatically joints as it files, bringing all teeth to an even size and keeping them uniform.

The Model F-16, which is the machine illustrated, has a filing speed of 55 teeth per minute. Power is supplied through a ¼ h.p. a.c. 60-cycle motor that will operate on 110 volt current. The machine occupies space 18x18 in. square on bench or pedestal.

Equipment for the Model F-16 includes one hand saw carrier for straight edged saws, one carrier for crowned saws, all hand saw attachments, metal and band saw attachment, self-adjusting cone arbor for circular saws, special rocker arms for band and circular saws, and electric light attachment. The Model F-16 for bench mounting as

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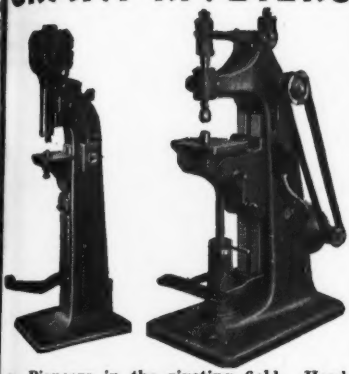

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shown in the illustration weighs 171 pounds.

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The line of buffing and polishing lathes marketed by the Standard Electrical Tool Company, Eighth and Evans Sts., Cincinnati, Ohio, has been augmented by the addition of a selective speed machine built to provide any spindle speed required. When equipped with patented adjustable speed sheaves a spindle speed increase of fifty per cent may be obtained with an infinite number of steps. Power is supplied by an 1800 r.p.m. ball bearing motor.

The design of the machine is said to be of particular advantage in districts where direct current is now in use and there is contemplated a change over to alternating current. The machine may be installed with a direct current motor and when the change over occurs, it is necessary only to change the electrical equipment on the buffing machine.

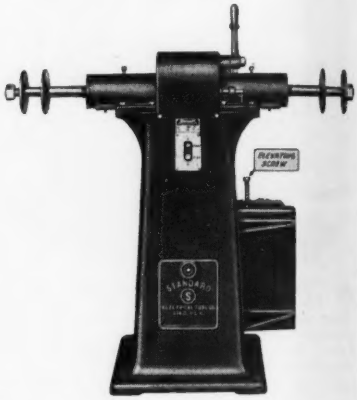

Fig. 1—"Standard" Selective Speed Buffing and Polishing Machine

Reference to Fig. 1 will show that a hand brake is provided for quickly stopping the spindle and thus reducing the time required for wheel changes. A shaft-locking device further assists in changing wheels. The push button operates a magnetic starter inside the pedestal, the starting having overload and underload voltage protection.

The spindle is of high grade nickel

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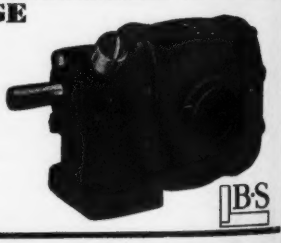

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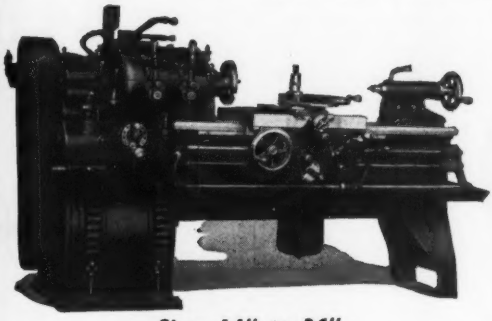

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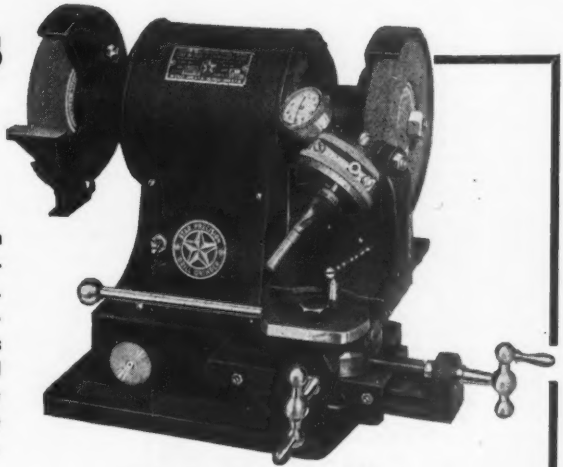

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steel. The entire spindle may be removed intact for renewing belts without disturbing the ball bearings. The ball bearings are oversize and are mounted in labyrinth sealed chambers. A sight oiler at each bearing insures proper lubrication at all times. Fig. 2 illustrates the manner in which power is transmitted to the buffing spindle through four Vee cog belts. An elevating screw permits raising and lowering the motor to adjust tension on the belts. Belts and sheaves are guarded by a hinged guard. The machine is available in 3, 5, 7½, 10, 15, and 20 horse power.

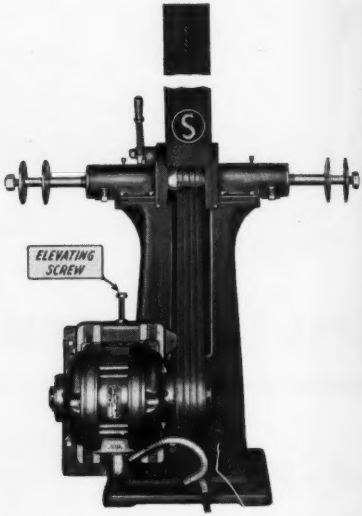
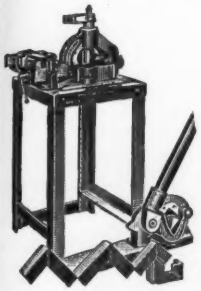


Fig. 2—View of interior showing power transmission equipment.

Newall Automatic Universal Thread Grinder

The illustration shows the Newall Automatic Universial Thread Grinder, which has been developed by the Reed-Prentice Corporation, Worcester, Mass., to grind taps, gages, dies, chasers, bolts, and all precision threaded work with accuracy and speed. Pitch error is controllable within 0.0001 inch.

The method used consists in taking a series of light cuts at a high rate of speed, a single-ribbed wheel being used for work such as thread gages. By this means the strains which are always



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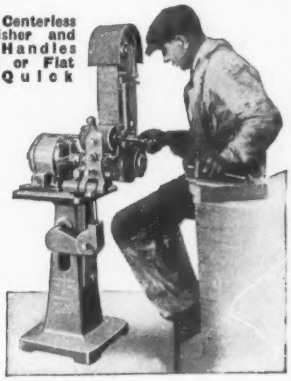

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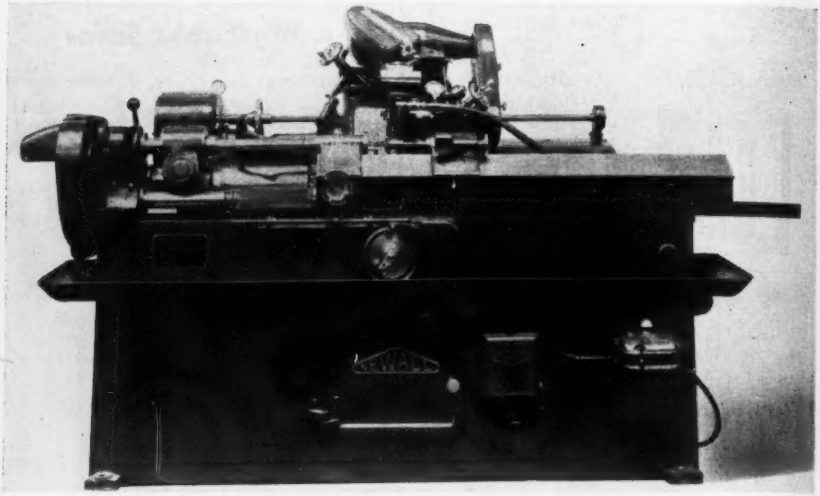

Newall Automatic Universal Thread Grinder

present in hardened work are released gently, and consequent errors are corrected as they are released. Drawing the temper of the work is avoided, the maximum of production is possible, and the amount of wheel wear and diamond wear is reduced. Provision is made, by means of a cam action, for grinding the relief on taps and for relieving straight and spiral flutes of any number.

One of the features of the machine is the diamond truing device with direct and positive control by the use of an enlarged thread form operating on the pantograph principle. A projector is used to obtain an enlarged profile of the diamond from which the stylus is made. The thread is obtained from a lead screw and change wheels, provision being made for right and left hand work. The lead screw is 2 in. diameter, with a hardened and ground thread. Owing to the scientific mounting of the lead screw and nut and its fine accuracy, supplemented by a pitch-correcting device, work can be ground to limits as fine as 0.0001 inch. Division for multi-thread work or annular grooves is obtained by a ground worm actuating a worm wheel. Any division may be made.

The wheel head is driven by an incorporated electric motor having two speeds. The spindle is hardened and lapped and runs in parallel adjustable white metal bearings. The endwise adjustment is particularly accurate. Thrust plates are integral with the spindle. Twelve work speeds are available from compounded belt cones; when required, a back gear can also be provided to double the number of available speeds. The automatic reverse operates at a fixed high speed rate independent of the cutting speed. The traverse motion is obtained from hydraulically-actuated clutches and operates smoothly even at high speed.

A helix angle of 15 deg. is obtainable, right or left hand, by swiveling the wheel head slide, motor, and dresser bodily in a cradle by means of a graduated dial.

The wheel is dressed by a wrought diamond, rectangular in shape for the single wheel dresser and chisel shape for the double-purpose device. The dressing devices are made to the finest limits of accuracy and of the hardest materials. In the principle used, every element of the thread is under direct and positive control and the dressing can be done without removing the work or upsetting the adjustments of the machine. In use, the stylus follows the contour of the large thread template and the diamond reproduces the exact thread form on the wheel.

The machine is made in two sizes, for grinding lengths of 10 in. or 20 in. Maximum length between centers is 10 in. or 36 in., and the maximum diameter that can be ground is 3 in. or 4 in. Helix obtainable, either right or left, is either 4 deg. or 15 deg.

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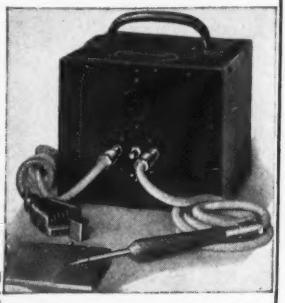

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IT'S no laughing matter if skilled hands around your shop must tire themselves with back-breaking loads. And you won't laugh when you compare the fancy price you pay for back power with the lower costs and faster production you get with a P&H Zip-Lift. It's the new light hoist that's fast and safe; push-button controlled; easier to install — and priced as low as $150 for the ⅛-ton unit. Write today for new folder on "Spot Handling".

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ESTABLISHED 1884
4535 W. National Ave., Milwaukee, Wis.

ZIP-LIFT

STOPS WASTE WITH "SPOT HANDLING"

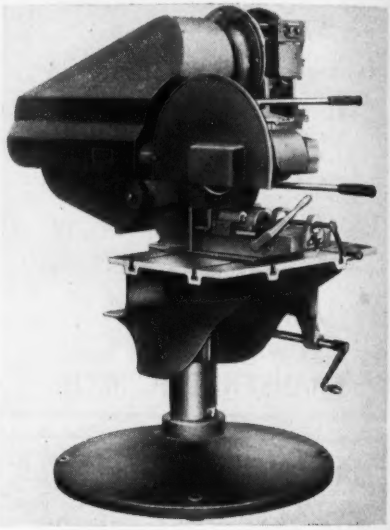
Bethlehem Abrasive Cut-Off Machine

To answer the need for an abrasive cut-off machine of sufficient capacity to handle a large majority of all cutting-off requirements—with flexibility making it a true general purpose tool—the Bethlehem Foundry and Machine Company, Bethlehem, Pa., has developed a Universal Cut-off Machine.

The machine provides both chop-cut stroke and draw-cut stroke, either one or a combination of both of which may be used to suit the requirements of any particular cutting job. By this means, for example, structural angles or channels may be cut with this machine with one set-up in the vise. On the other hand, small work such as bars, strip, tube, pipe and cable, may be chopped off with as great facility and speed as on machines not offering the capacity of this one.

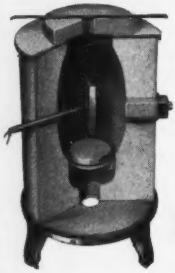
The machine is also not limited to cutting at right angles with the work. On the contrary, it will cut at any desired angle by swinging the head to the desired position with relation to the table. Exact position of the head is indicated by a graduated scale on the machine. In addition, if it is desired to cut very heavy work, such as castings, etc., that cannot be supported on the table, the head may be swung into any desired position, away from the table, to handle this work.

With the Bethlehem Universal Cut-Off Machine, the cut is so clean and smooth that generally no further machining or finishing is needed on the face cut. Such close accuracy may be maintained that the machine may be used to finish cut production pieces to size, eliminating additional operations and waste of material.



Bethlehem Abrasive Cut-Off Machine

The machine is adaptable for cutting dry, various materials ranging from cold rolled steel and non-ferrous metals to cinder blocks and brick. With auxiliary coolant system it is adaptable for cutting wet, all types of stone, concrete, porcelain and tile. With special trough for submersion of work, it is adaptable for cutting high speed and other alloy steels, glass, synthetic plastics, rubber and semi-precious stones, etc.



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Michigan Tool Gear Speeder

A gear speeder, designed to closely simulate actual operating conditions in the testing of gears for quietness, has been announced by Michigan Tool Company, 7171 McNichols Rd., Detroit, Mich. The machine is so designed that pairs of production gears can be run together both forwards and reverse, under loads,

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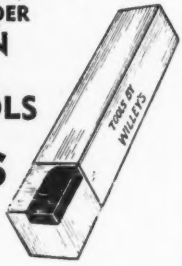
WILLEY'S

Prompt shipment from our complete stock of highest grade Precision Cutting Tools.



THIS CATALOG

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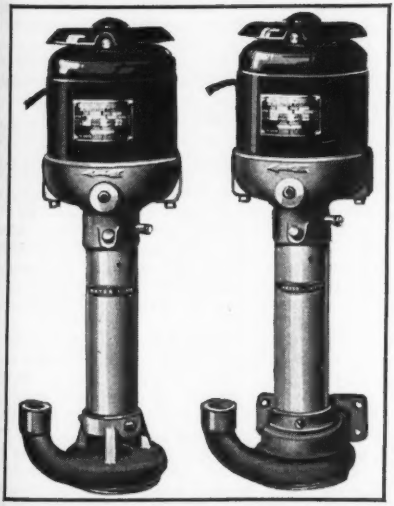
BROWNIE COOLANT PUMPS



There is always an uninterrupted flow of coolant when this pump is on the job. It is trouble free in operation. It is self-aligning. There are no packings to leak. There are no screens to clog. The drive shaft and impeller tube are one unit revolving together. Coolant cannot come in contact with the ball bearings which are within one inch of the impeller. Capacities are 10-100 G. P. M.

May we send you our Bulletin No. 4 further describing these pumps?

The Tomkins-Johnson Co.
620 N. Mechanic St., Jackson, Mich.

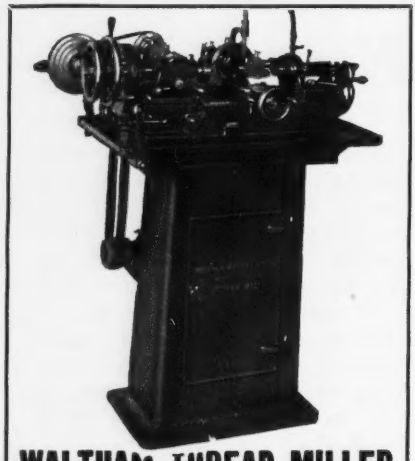
while being checked. This is obtained by providing the speeder with two spindles, each having its own drive and its own brake, all controlled through a single hand-wheel.

After the gears have been placed on the spindles, revolving of the handle in one direction a quarter turn applies the power to one spindle. Another quarter of a turn applies the brake to the opposite spindle. Returning the hand-wheel to the "neutral" position and continuing a quarter turn in the opposite direction applies the drive to the second spindle, while another quarter turn also applies the brake to spindle number one. Thus the condition of reversed loads, as are obtained in automobile transmissions, etc., can be accurately simulated with this equipment, and complete checks of gears for quietness under both conditions obtained in a single set-up.

The machine is designed to take gears up to 14 in. in length on the rear, and up to 17 in. in length on the front spindle—thus allowing for the largest of gear-clusters. Center distances are adjustable from 2⅝ to 5¾ in. maximum, permitting the testing of gears up to 8½ in. in diameter. Both spindles are provided with a 1½ in. hole to receive shanks of stem gears. The machine is particularly adaptable to the routine checking of gears in regular production, as an assurance against the introduction of variations during heat-treatment with different lots of gears or through errors in final finishing of gear bores, etc.

Michigan Tool Gear Speeder

The use of a gear speeder of course makes it unnecessary to continuously check production gears for eccentricity, involute, helix angle, spacing, etc., unless a run of noisy gears is encountered when a closer check of gear geometry becomes necessary to determine the cause of noisiness.



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Can be furnished with a variety of equipments for tool room or manufacturing purposes. Write us for particulars.

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WALTHAM, MASS.

Stark Series B Motor Drive Unit

The Stark Series B Motor Drive Unit illustrated has been developed by the Stark Tool Company, Waltham, Mass., from the original Stark Under-Bench Drive, now furnished with a three-speed drive pulley and providing a wide range of working speeds with a simple commercial motor.

The unit is said by the manufacturer to be a well designed and carefully made mechanism. Shafts are hardened ground and are mounted in Timken bearings. The helical steel gears run in a bath of special lubricant which, with a new type of oil seals, make the gear housing oil-tight; thus the lubricant is good for from three to five years without renewal.

The unit is equipped with a twin disc

Anderson Improved

Balancing Ways

No Leveling Required

A simple and excellent device for balancing straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Four Chilled iron discs rotate on sensitive special bearings

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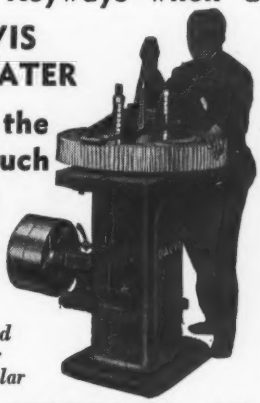

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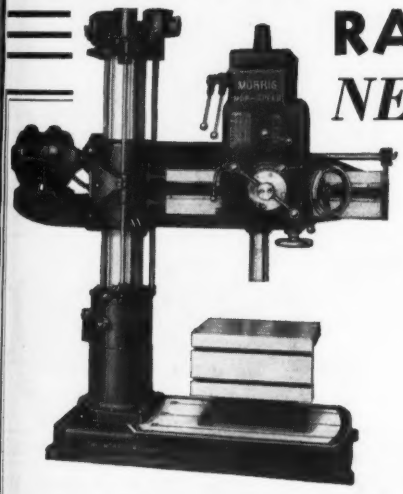


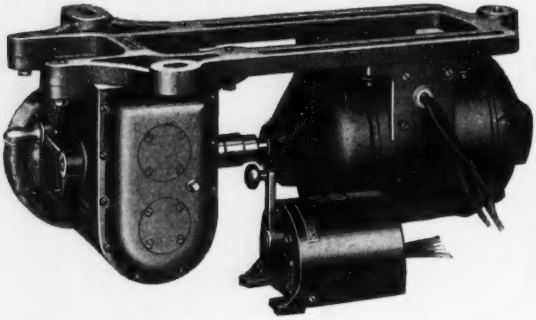
Every detail in the new "Mor-Speed" Radial Drills has been developed to insure maximum accuracy . . . highest production . . . simplest operation . . . and lowest cost.

May we send you the full facts on the "Mor-Speed" line. Write today.

Morris Machine Tool Co.

CINCINNATI OHIO

single plate clutch and a metallic flexible coupling of new design. The drive shaft is supported by an outboard arm or bracket fitted with Torrington Needle Bearings. Only one flat belt is used and there are no jack shafts or multiple belts. The unit is said to fit any bench lathe or milling machine and can be mounted under any factory bench without difficulty.



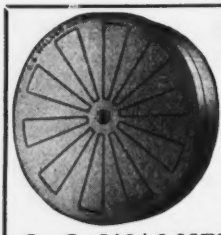
Stark Series B Motor Drive Unit

Union H. D. Steel Chuck

To meet the demand for chucks that will meet conditions set up by the use of the modern sintered carbide tools and heavier machine tools, the Union Manufacturing Company, New Britain, Conn., has brought out a line of heavy duty steel chucks in sizes from 6 in. to 36 in. The chucks are made especially for use on the ultra-modern heavy duty turret lathes and similar production machines where the maximum of speeds and feeds are desirable and where the operating conditions are of the most grueling type.

The chucks are built with forged steel bodies and extra large scrolls, pinions, screws, and jaws. The jaws are provided with deep serrations that give unusual gripping power.

Included in the line are Type A chucks which are built with jaws that can be moved to and from the work independently. The Type A No. 462 has four two-piece jaws, and the Type A No. 464



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2" Depth of Jaws. 4¼" Opening of Jaws.
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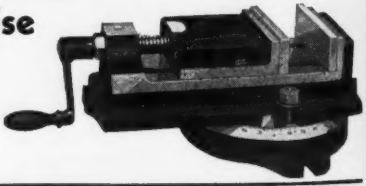

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INCREASES PRODUCTION
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It automatically compensates for misalignment between the machine spindle and the work.

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W. M. Ziegler Tool Co.

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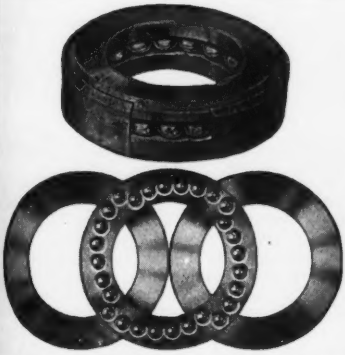

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Any quantity.

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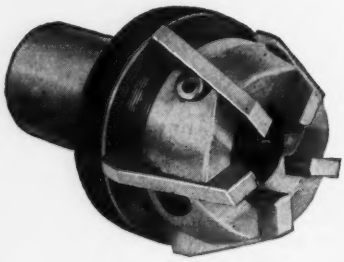

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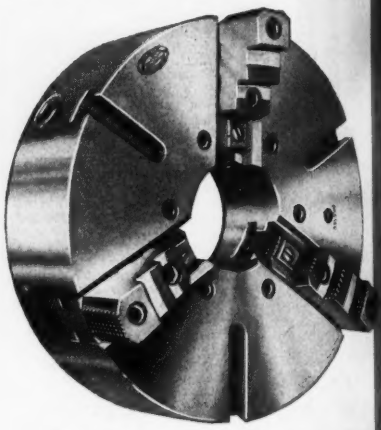
has four solid jaws. Type B chucks a universal, self-centering geared scr chucks on which all jaws move concen trically when a wrench is applied to a one of the several pinions. The Ty B No. 463 has three two-piece jaw Type C combination chucks have ja



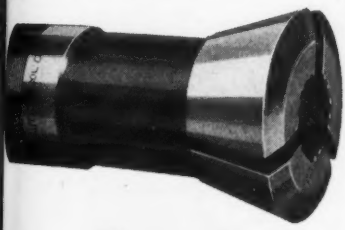
Union Type B No. 463 Heavy Duty Steel Chuck

which may be moved independently o all at once, as a scroll chucks. The Typ C No. 483 has three two-piece jaws and the Type C No. 484 has four two-piec jaws.

Vascoloy-Ramet Tantalum Carbid Tool Material

The Vanadium-Alloys Steel Company Vascoloy-Ramet Division, North Chicago Illinois, announces a complete line o hard carbide tool materials, comprising fourteen different grades, ranging in us from the machining of cast iron, bras and non-ferrous metals, to the machin ing of steels, including heat treate steels up to 500 Brinell. These hard car bide tool tips contain from 17 per cen to 80 per cent of Tantalum Carbide, the higher content of TaC being adapted for the machining of steels. It is as im portant to have a complete series o grades in hard alloys as it is to hav tool steel of differing tempers and an alyses. The tools are supplied complete brazed into steel shanks, or the tip may be obtained to be brazed into an accurately recessed steel shank with To bin bronze. The grades vary in hardnes from 85 Rockwell A to 91.5 Rockwell A

ly Diamond Serrations Can Deliver ll Power of Your Screw Machines



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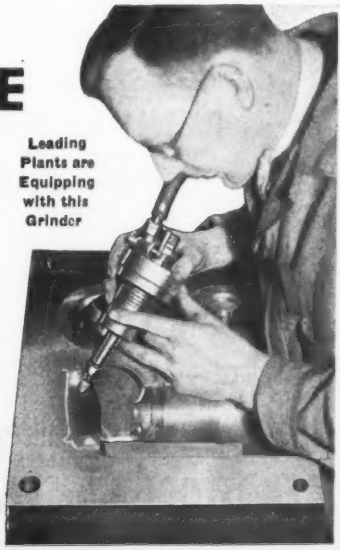

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TURBINE GRINDER
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and from 170,000 to 295,000 pounds a square inch in rupture tests.

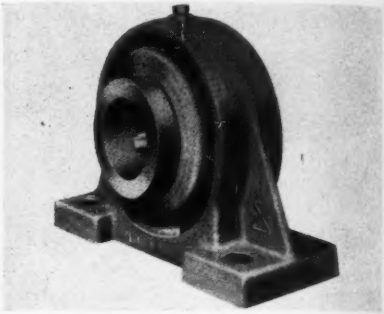
The function of the Tantalum Carbide in the composition is to resist "cratering" in lathe and boring tools. Steel is machined at speeds three to ten times as fast as may be done with some other tools. Cast iron is cut 250 to 350 ft. per min. with intermittent cuts as well as straight cutting.

Palmer-Bee Self-Aligning Pillow Block

The Self-Aligning Pillow Block illustrated has been developed by the Palmer-Bee Company, Westminster and Grand Trunk Railroad, Detroit, Mich., to simplify alignment of shafts and to take care of light or heavy shock loads at either high or low speeds. Among its distinctive features is its ability to withstand a greater shock load than a shaft of corresponding diameter. This feature is due to the housing construction, which is of cast steel.

The bearing operates on true ball-and-socket principle inasmuch as the housing is machine-finished to a spherical surface, and fit that permits a free oscillating movement of approximately 3 deg. maximum in any direction while at the same time maintaining an unbinding accurate alignment of shafts.

The pillow block is mounted with a Hyatt heavy-duty precision bearing in a machine finished housing that is dirt and dust proof. It is ideal for installation in places that are not readily accessible, inasmuch as lubrication is required but a few times per year. The block is available from stock in all standard shaft sizes for all types of



Palmer-Bee Self-Aligning Pillow Block

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Special Tools

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FAST SPIRAL END MILLS
OUR SPECIALTY

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A remarkable Time and Labor Saver
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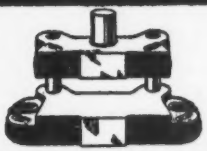

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Their predominating use as original equipment on machine tools of the highest grade is evidence of the high reputation of Skinner Chucks with discriminating users.

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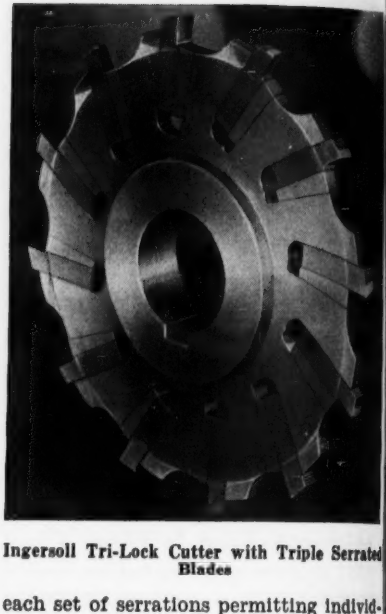
NEW BRITAIN, CONN., U. S. A.

service, and special sizes can be made up to specifications.

Ingersoll Tri-Lock Cutter

A cutter blade for use in narrow keyway or slotting operations, to be known as the Ingersoll Tri-Lock Cutter Blade, has been brought out by The Ingersoll Milling Machine Company, Rockford, Ill. Three sets of serrations are incorporated in the blade and wedge of the Ingersoll Tri-Lock Triple Serrated Blade Cutter,



Ingersoll Tri-Lock Cutter with Triple Serrated Blades

each set of serrations permitting individual adjustment of a member.

The cutter blade has horizontal and vertical serrations on its faces. The horizontal serrations permit adjustment in a diametrical direction to compensate for the major wear of the cutter blade, and the vertical serrations permit endwise adjustment of the blade, thus enabling the cutter to be accurately held to size. The double set of serrations in the wedge securely locks the blade in all directions.

Ingersoll Tri-Lock Cutter Blades as small as $\frac{1}{4}$ in. wide can be made, the width or diameter being easily maintained by the triple serrated blade lock. Many resizings can be obtained from a

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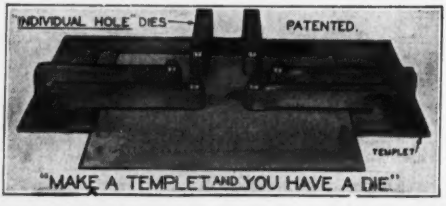
Why spend money for perforating dies when you can shift these "INDIVIDUAL HOLE" dies around to punch almost any arrangement of holes in flat parts?



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Every punch press on second operation work needs a guard. Protect your operators with the D. & M. Automatic Punch Press Guard. It is adaptable to all punch presses and operates efficiently and dependably.

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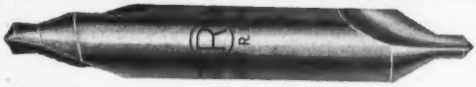

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L. G. NOBLE
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806 N. Oakland Ave.,
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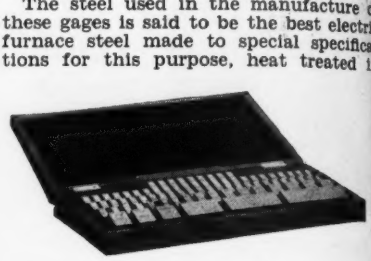
single set of blades, and a single blade can be replaced without having to discard the entire cutter. Ingersoll Tri-Lock Cutter Blades are of special selected high speed steel, fitted into a larged and heat treated alloy steel body.

Webber Gage Blocks

The illustrations show Set No. 81-B of Webber Gage Blocks which has been added to the line of precision gage blocks made by Webber Gage Company, 2517 Vestry Ave., Cleveland, Ohio. As indicated by the set number this set contains 81 blocks, making possible measurements ranging by ten thousandths from 0.200-in. to over 12.000 inches.

The steel used in the manufacture of these gages is said to be the best electric furnace steel made to special specifications for this purpose, heat treated in the most modern electric furnaces, and finished into gages which will check from 65 to 67 Rockweel C scale. Measurements taken over a period of years show no appreciable change in measurements.



Webber Gage Blocks

The blocks are guaranteed correct within 8 millionths of an inch of their marked size per inch of length or fraction thereof. All Webber gages are delivered with a coat of rust-proof lubricant of special composition and the set is contained in a large wood box as shown in the illustration.

Landis Collapsible Hand Tap

An improved hand tap of the collapsible type has been added to the line of collapsible taps manufactured by Landis Machine Company, Waynesboro, Pa. Illustrated herewith is one of these taps in the 1⅜-in. size, having an overall length of only 6 inches. The tap was

STOP
Punch Press Accidents With JOHNSON Safety Guards
Greater Protection
More Efficient Production
Lowest Cost
Easiest Installation
Write for circular and free trial offer.
E. P. Johnson Rule Mfg. Co.
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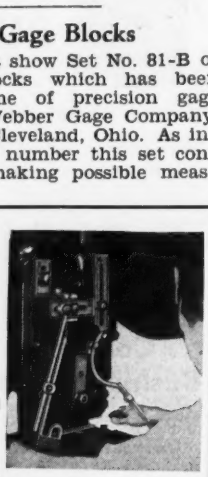

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"Built Like a Machine Tool"
The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION, complete with grease gun.
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BALANCED - GRIP FILE AND TOOL HANDLES
are used where comfort, durability and economy count.
Write for descriptive Price list. Send dime for sample handle. Steel lined — super service — 10 styles.
Use Osgood FILEGRIPS.
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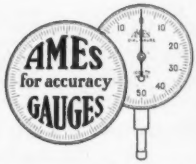
Dependable Service For A Quarter of a Century



Ames Gauges, like the one illustrated, are giving satisfactory service a quarter century after they were built. Reports are common that they do not need replacing, even though in constant use for nearly thirty years. They retain their accuracy and dependability for time indefinite.

So many tens of thousands of them are in operation that their wearing qualities have been proved beyond doubt. They are the standard by which all others are compared, and their leadership is retained by the records they have made.

For those jobs where accuracy and dependability are both essential, specify Ames Gauges. Many sizes and styles to choose from in Catalog No. 50. Write for it.

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Precision Made Easy

COMTORPLUG
A Measuring Internal Gage

Its gaging contact, at two points located at the forward end of the gaging head, provides the means of securing precise measurements of diameter THROUGHOUT THE LENGTH OF THE HOLE.

The Comtor Company
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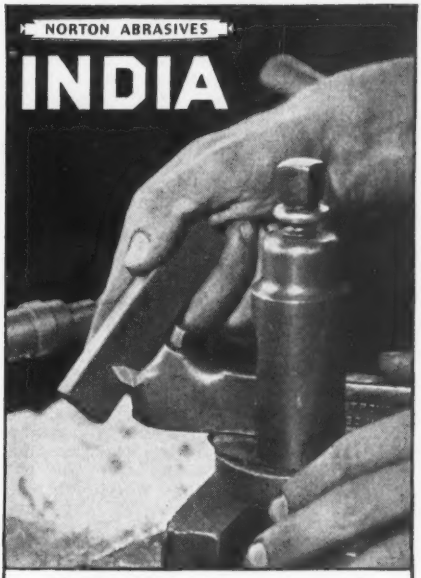

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For finishing moulds and dies INDIA OILSTONE SHAPES are indispensable. A great variety of sizes and styles assures a stone to suit every job.

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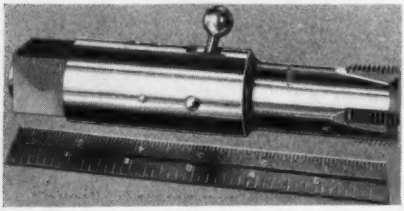
designed primarily as a hand sizing tap and offers the advantage of instant withdrawal from the work without having to be backed out. It eliminates the tearing of the threads and undue wear on the



Landis Collapsible Hand Tap

chasers frequently caused by backing out a solid tap.

The chasers are collapsed by pressing back on a small handle located on the side of the tap body, and are reset by pressing against a plunger which extends slightly beyond the rear of the tap shank. The shank can be supplied in any length desired and is provided with a square end to fit a wrench. Provision is made for diametrical adjustment of the tap of approximately 1/32 in. o and under the nominal chaser size. T adjusting screw is located in the fr end of the tap and is of the ratch type, making it self-locking to maint size. A turn of one notch to the adju ing screw gives a diametrical moveme of the chasers amounting to 0.001 in This feature makes the tap ideal hand sizing work. The Landis Collap ible Hand Tap can be supplied in sizes from 1⅜ to 12 in. inclusive.

Procunier High Speed Tapping Attachment

Procunier Safety Chuck Co., 12 Clinton St., Chicago, Ill., has broug out a high speed tapping attachme especially intended for use in the pe formance of high speed sensitive tappi operations on drill presses. Althou said to be the lightest and smallest ta ping attachment of this kind, it is sturdy construction and will afford positive drive for the tap.

A particular feature of the attachme is the Procunier "Tru-Grip" Tap Hold which, although claimed to be the smal est and lightest of its kind, is said t afford the maximum of gripping pow together with sensitivity and precision

Greenerd Arbor Presses

HYDRAULIC
HAND OPERATED
MOTOR DRIVEN

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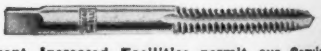
THREADWELL

Production Taps for Tough Tapping Jobs, Since 1905.



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Fans are equipped with SKF Ball Bearing Motors. Can operate in any position. High quality construction insures long life. Heavy wire guards $4.50 extra.

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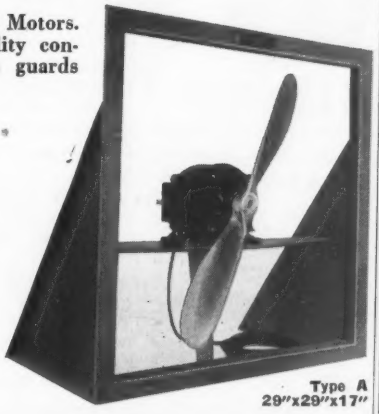
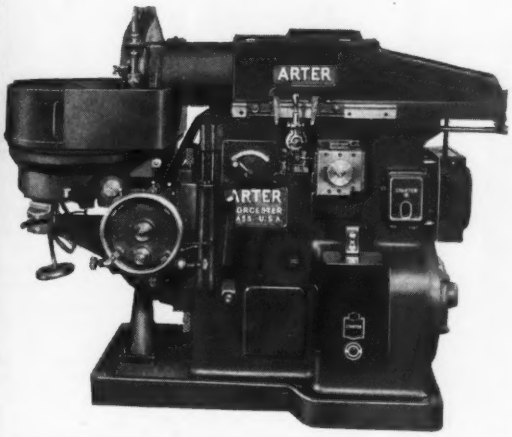


Type A
29"x29"x17"

Chelsea Fan & Blower Co., Inc.
370 W. 15th St. New York, N. Y.



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Hydraulically Operated. Built-in motor on wheel spindle.

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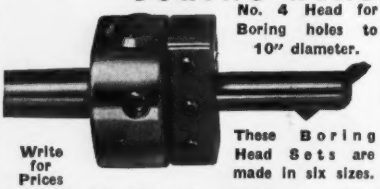

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These Boring Head Sets are made in six sizes.

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Columbia TOOL STEEL

During March the number of purchases of this product exceeded all records back to mid-year 1929.

Such customer confidence is highly valued.

It pays to use Good Tool Steel.

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MAIN OFFICE AND WORKS
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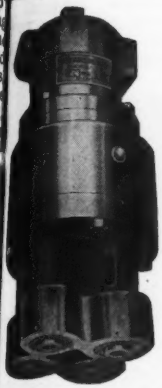
tapping. The weight of the "Tru-Grip" Tap Holder is only 2½ ounces, including the spring collet and chuck spindle. The tap holder is hardened and ground and incorporates the use of spring collets, one for each size of tap shank. The largest diameter is only ¾ in. round and the chuck spindle and tap holder are made in one piece to insure maximum accuracy and strength. The design of the holder is such that it is possible to tap very close to a shoulder

Procunier High Speed Tapping Attachment

and the small size provides for clear vision without stooping or sitting. The tap is driven by the square of its shank, which fits into a milled slot in the spring collet which, in turn, is driven by a broached portion in the tap holder.

The mechanism is enclosed in an aluminum housing and all steel parts are made as light as possible. Precision ball bearings provide for accuracy and rigidity. The reversing mechanism is of the planetary type, having three balanced heat treated intermediate gears which transmit reversing power from a heat treated ring gear attached to the drive shell to a hardened reversing gear which operates on a ball bearing. A double-cone cork-faced friction clutch provides a powerful, yet sensitive, friction drive and reverses and engages smoothly with the conical surfaces of the steel drive and reverse shells. The special cork facing is said to be prac-



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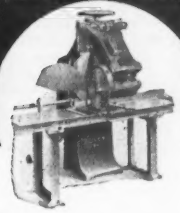
FOR TUBES, MOULDINGS, STRIPS OF METAL OR COMPOSITIONS

Saves time, space and money!



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- Ball Bearings
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- Extremely Accurate

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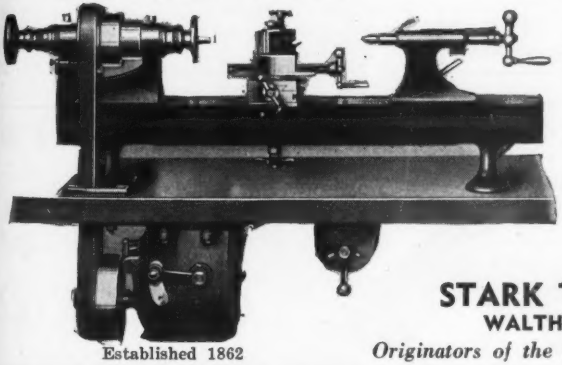
SERIES B MOTOR DRIVE UNIT



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Now furnished with 3-step Drive Pulley —9 Speeds with single speed commercial motor.
Drives with single flat belt. No Jackshaft. Fits any bench lathe or miller.
Driving Gears are helical steel meshing with hardened steel gears on hardened and ground shafts.
Steel worm shaft hardened and ground with phosphor bronze worm gear.
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Single disc clutch controlled by foot treadle, leaving operator's both hands free.
Timken Roller Bearings, throughout.
The original and best underbench drive.

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tically indestructable.

The capacity of the attachment is from No. 2 tap to 3/16 in. in steel and ¼ in. in brass or cast iron. Wrenches for locking and loosening taps, together with a set of four collets, are furnished with each attachment.

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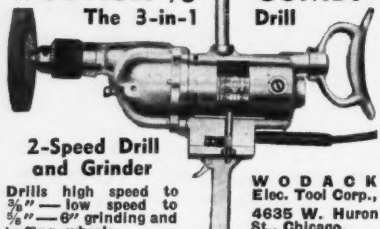
The constant rise in the standards of quality and accuracy in modern manufacturing have fostered an ever-increasing demand for optical measuring instruments of the highest precision, among which is the profile or contour projector. To meet this demand, Leitz, Inc., 60 East 10th St., New York N. Y., has brought out the Leitz Profile Contour Projector shown in the illustration. This instrument is intended for use in the examination and measurement of tools or other objects, the design of the instrument being such that it is possible to project the image of a standard pattern side by side with the test piece so that the two may be compared.

Leitz Profile Contour Projector

An outstanding feature of the instru-

WODACK 5/8" "COMBI"
The 3-in-1 Drill



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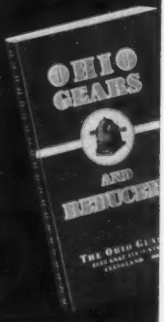

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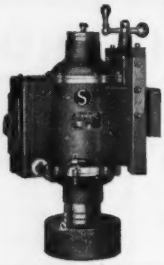

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For Planer, Boring Mill, etc.
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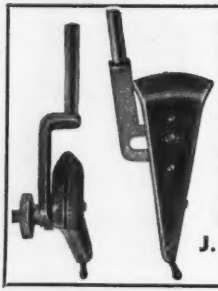

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Grinding Surface Internal External Lapping

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ment is the optical system which forms an intermediate image of the measuring plate in the plane of the object. The master piece or drawing is placed on a stage below the optical system for intermediate projection and the piece to be examined is placed on a stage above. Both images, and as of the same plane, are projected onto a projection table simultaneously, both magnified to the same degree. Thus readings can be made direct with the magnified image of the master scale as the standard measuring unit.

For testing the pitch of screws and for taking precision measurements by means of block gages, the ordinary object stage is supplanted by the "Frey" precision measuring stage. Combined with the Profile Contour Projector, this will be found to meet all requirements of industrial or laboratory work. The measuring stage is fitted with a feed mechanism which allows of the lateral movement of the screw under test, by means of which consecutive portions of the thread can in turn be brought into the field of projection. The travel of this feed is approximately 6 in., which is sufficient for all normal requirements.

The master form and projection must coincide exactly after every lateral movement. The form may consist of a drawing fixed to the table, or the projected image of a line-drawn plate correctly etched and placed on the intermediate stage. An apparatus with two dead centers permits of the mounting and checking of the accuracy and form of the turned parts produced according to pattern. If a pitch error is discovered in a screw under examination, the projected image can be made to coincide with the master profile and the extent of the error can be read on a dial indicator.

The range of magnification, the size of the fields which can be projected, and the perfection of the correction of every

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DAYTON, OHIO, U. S. A.

optical system used in this projector are used to suit the most exacting demands in making instruments. According to the manufacturer, each part of the mechanism is of such standard of perfection that even through the magnification of the optical system, any possible source of error or inaccuracy is completely eliminated.

Scully-Jones Red Heat Stellite Center

The illustration shows the Red Heat Stellite Center which has been placed on the market by Scully-Jones & Co., 1901 S. Rockwell St., Chicago, Ill. The center consists primarily of a stellite center swaged into a heat treated alloy steel body, and is intended for use on high production machines. The "red hardness" quality of Stellite, together with its resistance to abrasion, are calculated to multiply the life of a "Red Heat" Stellite Center many times over that of the ordinary center.

Scully-Jones "Red Heat" Stellite Center

The center is available in any size desired, to fit any type of machine in which centers are used.

2, 3 & 4-way VALVES

For use on air, water, steam or oil for operating single and double acting cylinders, on pressures up to 5000 lbs. Made in Lever, Foot and Solenoid and Motor Operated types.

Bulletins on request

W. H. NICHOLSON & CO.
136 Oregon St., Wilkes-Barre, Pa.

"Mezurall" Tape-Rule

The Lufkin Rule Co., Saginaw, Mich., has brought out a 6-ft. steel tape-rule to be known as the "Mezurall." The feature of this rule consists in that measurements can be taken in corners and correct readings obtained without necessity of bending the rule and trying to lay the tape into the exact corner. Measurements are taken with either the butt end or the hook in the usual way, an inside measurement being taken by laying the rule with the square back edge of the case against one side of the corner or opening, which is being measured with the blade extended to the other limit. By adding two inches to

Lufkin "Mezurall" Tape-Rule

EVERY SHOP needs these rugged, accurate portable Pyrometers. L88 for checking **Surface Temperatures:** 800° range with 1 ft. silver tip couple, $17.90. L89 for **Non-ferrous Metals:** 1600° range with 2 ft. couple and 1 ft. replaceable tip, $19.30. L90 for **Furnaces:** 2500° range with 3 ft. couple, $19.00. Sent on 30-Day Trial. Circular Free.
RUSSELL ELECTRIC CO.
338 W. Huron St., Chicago

Hold-Heet Pyrometers

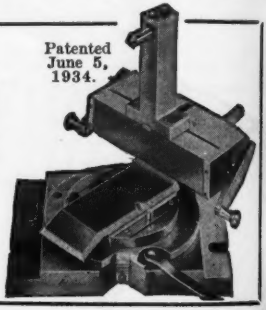
The Vinco Angle Tangent to Radius Dresser

For Internal, External and Surface Grinding Machines

The Vinco Dresser makes crude, expensive and inaccurate methods of wheel dressing unnecessary, for it will dress angles and radii tangent to each other for less than 25% of the cost of any other method. Our method of dressing is based on the scientific principle that angles and radii to be tangent must be dressed from the same axis without moving the diamond. One of the largest manufacturers of precision bearings purchased five Vinco Dressers about a year ago. The savings were so phenomenal that they have just bought four more dressers. They say, "These dressers give us accuracy and have eliminated all our worry and uncertainty in dressing angles and radii tangent to each other on abrasive wheels." This dresser is precision made of the finest materials and guaranteed to be satisfactory. **Send for Descriptive Circular**

VINCO TOOL CO., 7354 CENTRAL AVE. DETROIT, MICHIGAN

Patented June 5, 1934.



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TRADE MARK

Alligator Brand Files are available in a complete line of Swiss and American patterns in all sizes, shapes, and cuts to fill every filing need. When you purchase these files, you do so with our guarantee that they have passed the highest tests as to shape, cutting quality and uniform hardness and are perfect in every respect.

Write for catalog and prices.

Specify files bearing the Alligator trade mark.

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21-23 Prospect St. Newark, N. J.

AUTOMATIC BUILT-IN RELIEF VALVE

In this Rollway Pump can be adjusted to any given pressure—transfers surplus fluid back to suction, not to supply tank.

SEND FOR DATA SHEET

Describing the Rollway high-vacuum, self-priming pump, with or without automatic built-in relief valve. Also reversing models.

PIONEER
ENGINEERING AND MFG. COMPANY
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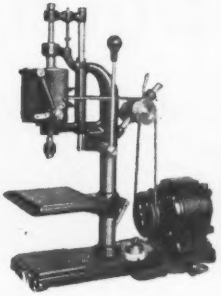
Also Centrifugal and Hydraulic Pumps

The Rollway Pump

Here are TWO MONEY SAVERS FOR YOUR SHOP

The Boston Universal Angle Plate is an accurate tool adaptable to all phases of machine work—miller, drill, planer and shaper.

It eliminates costly fixtures, decreases production costs, increases jobbing output. Every machine shop will find this tool a good investment.



This Victor 5-Speed Super Drill is a real cost-reducing bench tool. The Wonder pulley which enables operator to change speeds instantly, is just one of 10 outstanding features. No belts to change. Ball bearings at all points of wear eliminate the necessity of constant oiling and since friction is reduced, long life is assured. Accurately built of ample proportion, this versatile drill is an excellent buy.

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459 WATERTOWN STREET NEWTONVILLE, BOSTON, MASS.

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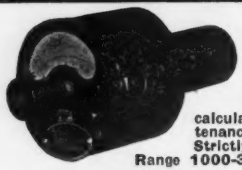

STOP spoilage. Get exact temperature of work in furnace. Direct reading; no calculations; no maintenance expense. Strictly automatic.
Range 1000-3600° F.
Special bulletins on request.
THE PYROMETER INSTRUMENT CO.
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Bond

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Delivery from Stock

Ratios 5-1 to 2500-1

FOR your speed-reducing problems, specify Bond Speed Reducers. Trouble-proof service at moderate cost.

Details and list prices for the asking. Send for catalog GA-37a.

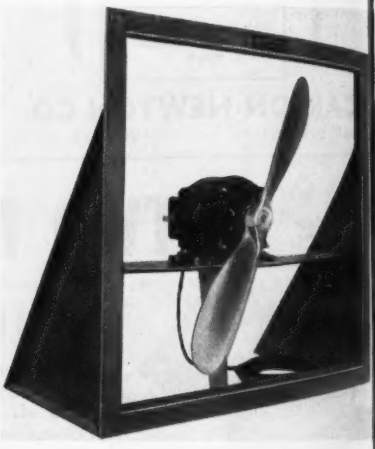
CHARLES Bond COMPANY
617-623 Arch Street, Philadelphia, Pa.

the reading indicated an accurate measurement is obtained, the case being exactly two inches wide.

The end hook of the tape-rule has a short sliding action and thus automatically adjusts itself to provide an accurate reading when hooked over the object. The rule may easily be carried in the pocket, being small and light in weight. Like all other Lufkin tape-rules the steel blade will stand unsupported like a rule, yet can be flexed like a tape.

"Chelsea" Fans

The illustration shows one of the line of air blast fans now being marketed by the Chelsea Fan & Blower Co., Inc., 370 West 15th St., New York, N. Y. The fan shown—the Type A—is designed to set on the floor for the purpose of cir-



"Chelsea" Type A Fan

culating the air, and will circulate 5,000 cu. ft. of air per minute. The propeller blade is 24 in. and is powered by a ½ h.p. 1750 r.p.m. SKF ball bearing motor which is so constructed that it will operate in temperatures from 110 deg. to 30 deg. below zero Fahrenheit.

The fan is recommended for industrial plants requiring a large volume of air circulation and can be furnished with a heavy wire guard front and back if required. It is made from high grade materials and is guaranteed to be free of faulty workmanship or material for one year.

1905 Strand 1936

FLEXIBLE SHAFTS
and
TYPE ML5 MACHINES

QUALITY EQUIPMENT ONLY

Value is best judged by what you get not what you pay.

You make no mistake when you buy

"STRAND"
Flexible Shafts or Machines.

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N. A. STRAND & CO.

5001 N. Lincoln St., Chicago, Ill.

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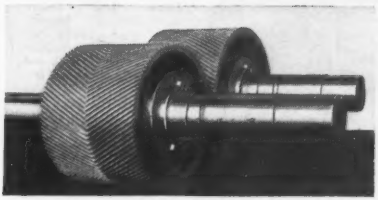

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The Sykes process of generation of gear teeth provides the nearest practical approach to theoretical accuracy. Combining this basic advantage with every modern facility made possible by recent technical progress results in gears of the highest degree of precision.

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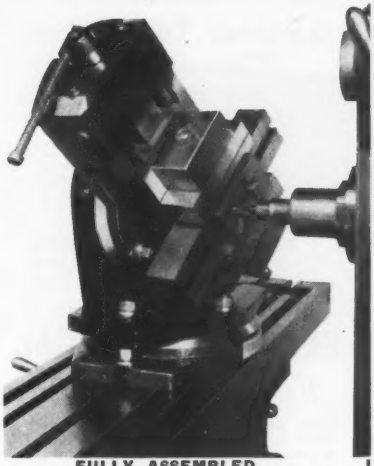

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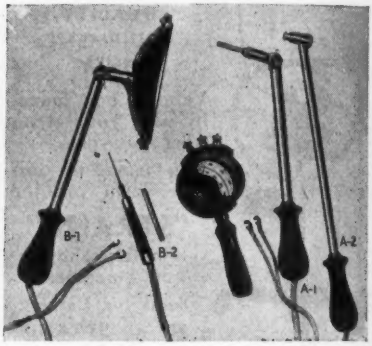
1253 Columbia St., Dayton, Ohio

Pyro Improved Surface and Needle Pyrometer

The Pyrometer Instrument Company, 101-105 Lafayette St., New York, N. Y., has brought out an improved surface and needle pyrometer which will find universal application in many industries such as die casting, plastic molding, rubber processing, papér, textile, elec-



Pyro Surface and Needle Pyrometer with Attachments

trical, metallurgical, and so on. The feature of the pyrometer is its adaptability; by merely interchanging the various types of thermocouples, the instrument can be transformed into any one of four different types of surface and needle pyrometer. The new indicator is equipped with a Pyro patented clamping device which renders simultaneous contact and reading of actual temperatures unnecessary due to the fact that the indicating needle will remain fixed at the correct temperature indication after contact has been made. The combination pyrometer embodies all the various features of the standard Pyro "A" and

ELIMINATE SPECIAL AND COSTLY JIG FIXTURES

By Using Yost Drill Press Vises

They are heavily constructed and very compact. Three flanges on the base permit easy attachment to machine or drill press table. A "V" shaped slot milled in the movable jaw permits a positive locking of vertical work. The ease and simplicity in operating makes this tool an indispensable factor in the execution of drill press operations.

Write us for circular "H", giving us name of your nearest dealer.

YOST MANUFACTURING COMPANY MEADVILLE, PA.

GUARD PRESSES!

with

Junkin Safety Guards

New . . . Scientific. They reduce accidents . . . Speed up work. Easy to install . . . Care-Free. A single injury can be more expensive than many guards.

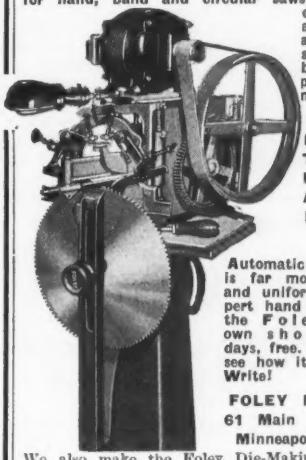
Don't delay, write now for full facts.

Junkin Safety Appliance Co., Inc.
930 W. Hill St. Louisville, Ky.

Keep All Saws Sharp . . . with

FOLEY AUTOMATIC SAW FILER

for hand, band and circular saws for wood-cutting . . . also for metal cutting saws for brass, copper and aluminum.



EVERY TOOTH UNIFORM ACCURATE FILING

Automatic saw filing is far more accurate and uniform than expert hand filing. Try the Foley in your own shop for 30 days, free. Then you'll see how it cuts costs. Write!

FOLEY MFG. CO.
61 Main St., N. E.
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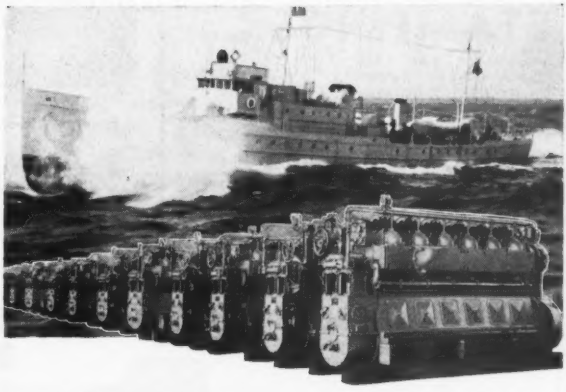
We also make the Foley Die-Making Machine and Foley Automatic Hack Saw Grinder.

WINTON comes to BANTAM



HERE is a string of thirty-six Winton Diesel Engines, 670 H.P. each, furnished recently for eighteen United States Coast Guard cutters. Each of these Winton Engines, like practically every other Diesel made, is equipped with Bantam Quill Roller Bearings.

This is just one more indication of industry's rapidly growing reliance on Bantam. When you consider that 95% of the automobiles using quill bearings use Bantams, that practically all Diesel Engine builders use them and that there were more large Bantam installations listed in the steel mills during 1935 than all other makes combined, there are evidently some good reasons why you should use them in your product.

Write and tell us your requirements, or ask us to send a Bantam Engineer.

THE BANTAM BALL BEARING CO.

SOUTH BEND, INDIANA

(SUBSIDIARY OF THE TORRINGTON CO.)

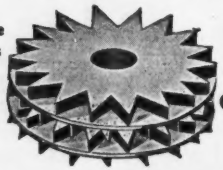
BBB TAKE YOUR TOUGHEST BEARING JOB TO BANTAM

"B" surface pyrometers. The indicator has two scales from 30 deg. F. to 400 deg. F. marked A and B and the respective scale letter is engraved on the metal tubes of the attachments.

The A-1 attachment is designed to rapidly and accurately determine the temperature of molds used in the manufacture of plastics or any other surface where small thermocouple contact is required. Type A-2 attachment is the off-set handle type for flat surfaces, the same as furnished with the standard Pyro Model A surface pyrometer. Type B-1 is for determining surface temperatures of stationary or moving rolls. In use, the strip thermocouple is pressed into contact with and conforms to the shape of the hot surface. This type is also equipped with a universal swivel joint which allows the thermocouple to be placed in any angular position required to permit proper contact with the heated surface. Guides center the couple junction exactly and prevent application of excessive pressure. Type B-2 is a needle pyrometer used exclusively for determining the inside temperatures of various materials in plastic state in certain operations. The insertion element is a sensitive thermocouple housed in a hollow needle. A cover is provided to protect the thermocouple needle when not in use.

Grinding Wheel Dressers

We make all types of Dressers and Cutters



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STAMPINGS

IN LARGE AND SMALL QUANTITY RUNS

Also Short Run Stampings eliminate expensive tools.

MODEL WORK

Send sketch or samples for quotation.

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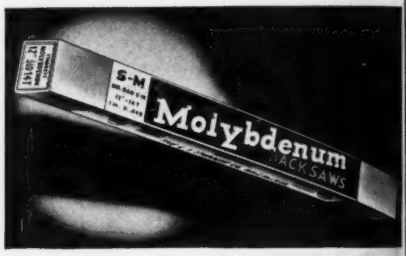
THIRD & VINE STS. CINCINNATI, O.

Starrett "S-M" Molybdenum Hacksaw Blade

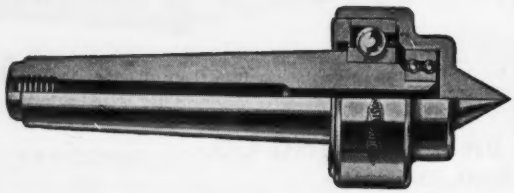
The L. S. Starrett Co., Athol, Mass., has added to its line of tools a Molybdenum Hacksaw Blade to be identified



Starrett "S-M" Molybdenum Hacksaw Blade

as the "S-M". This new blade is said to be the result of recently developed heat treating methods applied to molybdenum steel. The hard, long-wearing qualities of molybdenum make the blade especially useful for fast, economical

STURDIMATIC LIVE CENTER for LATHES, GRINDERS and MILLING MACHINES



It turns with the work. Eliminates friction of dead center.

Lowest possible overhang prevents vibration and chatter.

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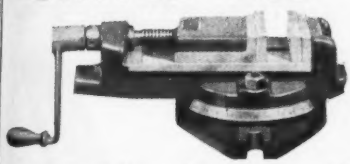
UNIVERSAL SWIVEL VISE



For milling machines, shapers, planers, drill presses.

Jaws are tool steel, hardened and ground. Circular base graduated in degrees.

Vise can be removed from circular base and used as plain vise if desired.

Width of jaws 4" Depth of jaws 1½" Jaw opens 3" **$16.00**

Width of jaws 6" Depth of jaws 1½" Jaw opens 4" **$22.00**

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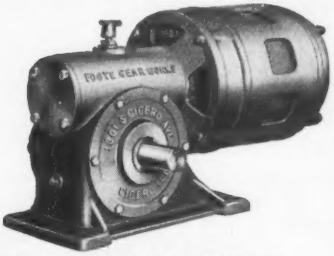
Explosion Proof

motors may be moved without disturbing underwriters label.



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Patented feature in all sizes and styles. Oil cannot enter the motor from reducer housing.

Write for new 128 page book of useful data FREE. Ask for book No. 6.

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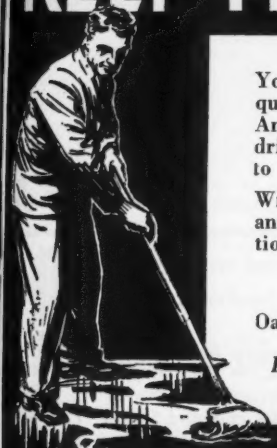

You will be astonished at how inexpensively and quickly you can clean floors with Oakite Penetrant. An ounce or two to the gallon of water removes oil drippings from machinery, leaves floors clean, safe to walk on. Easy to mop up, too!

Write for FREE booklet giving further details of this and other money-saving Oakite materials for production cleaning, burnishing, grinding, rust proofing.

Manufactured only by

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Branch Offices and Representatives Located in All Principal Cities of the U. S.

with **OAKITE PENETRANT**

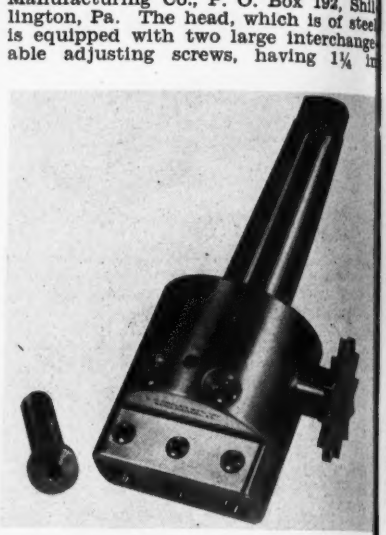
TRADE MARK REG. U.S. PAT. OFF.

cutting on nickel, monel metal, or stainless steel alloys, high-speed, manganese or tool steel, and similar hard alloys.

The new Starrett "S-M" Molybdenum Saw is made in 10 and 12-in. lengths and in 14, 18, 24, and 32 teeth per inch sizes for hand frames. Power blades are made in 12, 14, 17, 18, 21 and 24-in. lengths, and in 4, 6, 10, and 14 teeth per inch.

Craley Combination Boring, Turning and Facing Head

A combination heavy duty head designed to handle a wide range of work on boring, drilling and milling machines has been brought out by C. C. Craley Manufacturing Co., P. O. Box 192, Shillington, Pa. The head, which is of steel is equipped with two large interchangeable adjusting screws, having 1¼ in



Craley Combination Boring, Turning, and Facing Head

dia. 20 P. threads of high grade oil hardening tool steel, properly tempered with two hardened thrust washers at each end of the screw, to take care of wear or end play.

The cut shows the head equipped with a star wheel feed screw to be used when performing such operations as facing, undercutting, and so on. A special trip makes it possible to adjust the star wheel one or two points at each revolution of the spindle.

The feed is instantly started or stopped by engaging or releasing the spring

CENTERLESS GRINDING
STRAIGHT - CYLINDRICAL
DOUBLE DIAMETER
SHOULDER AND PROFILE
SURFACES
All Kinds of Materials
SCREW MACHINE PRODUCTS, HEAT-TREATED AND GROUND, IF NECESSARY
Send Blueprints or Samples for Estimates
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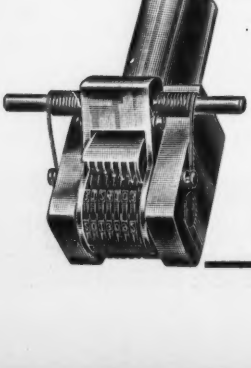
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Concerns — and Many Smaller Concerns
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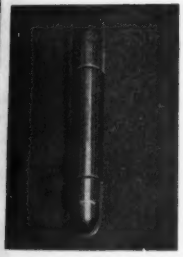
Precision Made — Automatic — Non-Automatic 1 to 10 Wheels — Press or Hand Styles
Send Us Your Marking Problem
NUMBERALL STAMP & TOOL COMPANY
HUGUENOT PARK, STATEN ISLAND, N. Y.

tension plunger. When the head is used for boring or turning, the graduated dial screw shown replaces the star feed screw. The tool-carrying block and dovetail bearing is of one-piece construction of tempered oil hardening tool steel. Four openings, each of 1⅛ in. diameter, are provided for the boring bars —three in the face and the fourth through the block at right angles. The block is 6 in. long, 2½ in. wide, 3¼ in. high, with 2½ in. travel, 1¼ in. right or left from center for hand or power feed and is accurately fitted to a 6 in. diameter steel head, 4⅜ in. thick.

The tension screws are so arranged that all the cutting strain is against solid metal. Oil grooves are provided for lubricating the bearings. The capacity of the head is from 0 to 20 in. diameter.

A.-S.-E. Lockers

A number of new features are incorporated in the design of the new line of lockers recently announced by All-Steel Equip Company, Inc., 609 John St., Aurora, Ill. One of these features is the radically different style of locker handle, illustrated here. The handle was designed to follow true functional requirements rather than precedence. Conforming in line with the locker itself, the handle is said to permit easy grasp with thumb and forefinger and is so designed as to prevent using as a hanger for towels or clothing.



Handle on New Type of A-S-E Locker

Other features of the new lockers are the streamlined hinge, built into the door, and the new style louvers. The louvers not only provide improved appearance and decoration to the door front, but permit increased ventilation.

Skilsaw "Defender" Drills

Three new models of electric drills have been added to the line of Skilsaw Drills manufactured by Skilsaw, Inc., 3334 Elston Ave., Chicago, Ill. These include ¼ in. and ½ in. sizes to be known as "Defender" drills, and a ¼-in. size classified as the Model 40 Special Duty. The design of the drills is said to em-

"Tools You Can Trust"

SHIELD STANDARD TOOL CO. BRAND

TWIST DRILLS
MILLING CUTTERS
DRILL CHUCKS
REAMERS
TAPS, ETC.
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For Factory & Shop

Sturdy ALL-STEEL construction, well braced and welded thruout. Painted Moss Green. Height Over all 29". Width Overall 26". Top and bottom rail punched to take a 12" plank. Also special built bench legs.

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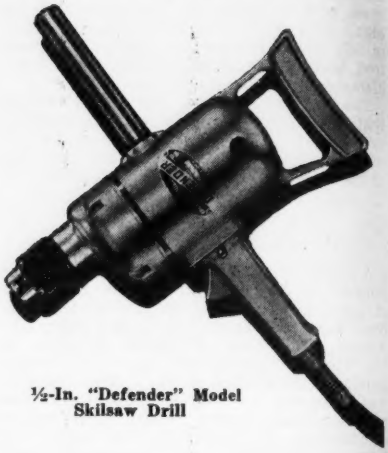
Erie Concrete & Steel Supply Co.
13th & Cranberry Sts. Erie, Pa.

body many engineering and construction features which have never before been offered in the low price field, the motor construction being identical with that of the regular Skilsaw Drills. The overload capacity is unusually large, adding to the life of the motor and assuring cool running. Gears are of special alloy steel, helical cut for quiet operation.



½-In. "Defender" Model Skilsaw Drill

The frame—as on all Skilsaw Drills—is of die cast aluminum alloy. Each model is fitted with a three-jaw geared chuck of finest quality.

The ¼ in. Defender Drill is equipped with Oilite and ball bearings on the armature shaft and with bronze and ball thrust bearings on the gears and spindle. The switch is enclosed in bakelite housing. This model is 12 in. long overall and weighs 4¼ lbs. The ½ in. Defender Drill is of compact construction and unusually light weight. It is

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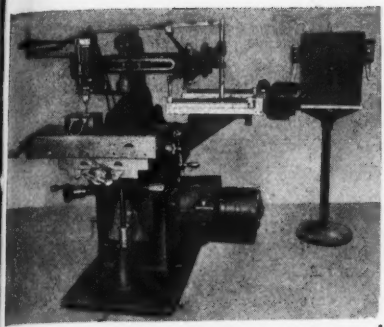
20 years without a drink—

ARGUTO OILLESS BEARING CO.
Wayne Junction, Philadelphia, Pa.



Marquette Three Dimensional Universal Engraving Machine

This new Diesinking and Profiling machine is specially designed for quickly and accurately cutting dies and molds in third dimensional direction as well as flat work, design pieces, lettering, profiling, etc. All motions are automatically controlled — also semi-automatic if desired.

Write for full details.

Marquette Mechanical Eng. Co.
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• 11¼ in. Swing . . . Two bed lengths . . . 24 and 36 in. center distances . . . 1 1/16 in. Spindle Hole.

Semi-quick change gear box with gears for cutting 4 to 80 threads per inch.

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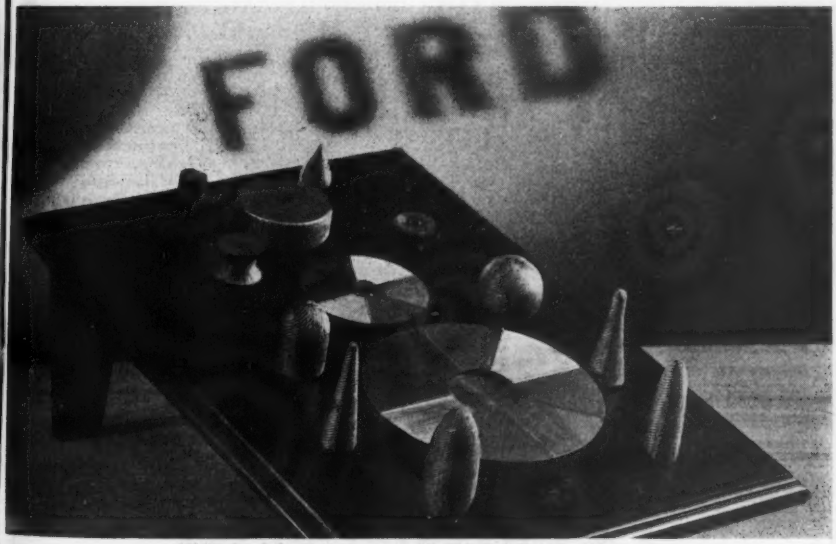


Write for information on complete line of Rotary Files.

M. A. Ford Mfg. Co., 108 Harrison St., Davenport, Iowa

but 13½ in. long and weighs 9¼ lbs. It is ideal for close corner work, because it measures only 1⅜ in. from center of spindle to outer edge of frame. This model is also equipped with Oilite and ball bearings.

¼-In. "Defender" Model Skilsaw Drill

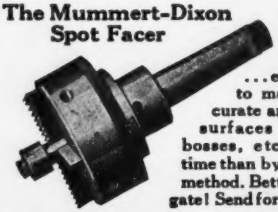
The Model 40 Skilsaw Drill has capacity for ¼ in. in steel and is classified as a special duty tool. The armature and spindle are mounted in high quality ball bearings. The motor is unusually powerful and has exceptional overload capacity. Gears are of special alloy steel, helical cut. The motor shaft and spindle are of chrome nickel steel, heat treated for maximum hardness. The frame is of light, durable die-cast aluminum alloy. Length overall is 12 in. and the weight is only 5½ lb.

Model 40 Skilsaw Drill

Johnson Basket Guard

To aid in the elimination of hazard from punch press operation and render the operation of stamping presses as safe as any other types of machines, E. P. Johnson Rule Mfg. Co., 565 W. Washington Bl., Chicago, Ill., has placed on the market a line of safety guards, one of which is illustrated herewith. The

Pulls gears, pulleys, wheels, pinions . . regardless of distance from end of shaft. Has special hooks for motor pulleys and bushings.
ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
303 Sheldon Street Chicago, U. S. A.

The Mummert-Dixon Spot Facer

. . . enables you to machine accurate and smooth surfaces on small bosses, etc., in less time than by any other method. Better investigate! Send for a bulletin.
MUMMERT-DIXON CO. 120 Philadelphia St. HANOVER, PA.

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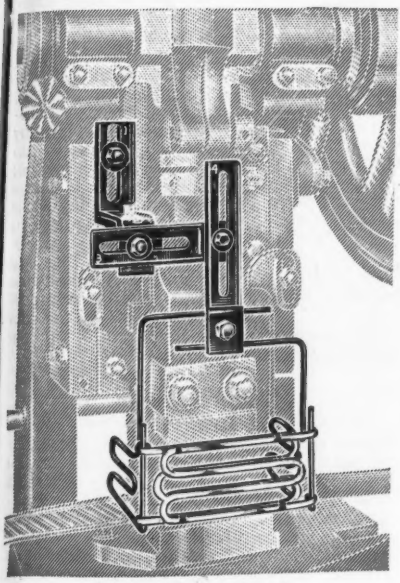
S & S MACHINE WORKS
4541 W. LAKE STREET HARDWARE DIVISION CHICAGO, ILLINOIS

guard shown is the No. 2 enclosure, comprising a sliding gate barrier in front with protecting bars on the sides.

The No. 2 can be used with practically any type of die, and is adjustable to both size and position. It is attached to the press at only one point, and has no connection in any way with the die.



Johnson Basket Guard

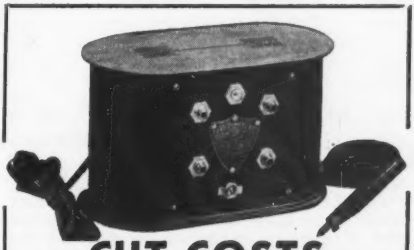
There are no holes to be drilled, and the guard can quickly be removed when necessary for access to the die.

The No. 2 enclosure is available in three sizes for width adjustment, the No. 2A being adjustable from 6 to 10 in., the No. 2B from 8 to 13 in., and the No. 2C from 11 to 19 in.

Fafnir Self-Aligning Bearings with Double Shields

A new group of ball bearings which combine internal self-alignment with double grease-shield protection has been introduced by The Fafnir Bearing Company, New Britain, Conn. They have been developed primarily to meet requirements of the aircraft industry, but are expected to have other industrial applications as well.

The new bearings are of the double-row type, the two rows of balls operating on a spherical race surface on the



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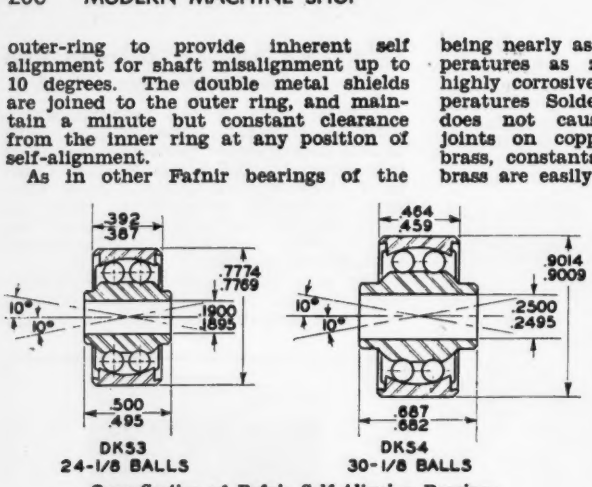
outer-ring to provide inherent self alignment for shaft misalignment up to 10 degrees. The double metal shields are joined to the outer ring, and maintain a minute but constant clearance from the inner ring at any position of self-alignment.

As in other Fafnir bearings of the double-shield type, the new units are supplied pre-packed with lubricant. Rings and balls are of SAE 52100 steel, and rings are cadmium plated on exposed surfaces for corrosion resistance.



Cross-Section of Fafnir Self-Aligning Bearings

Dimensions for two bearings of this type now available from stock are shown on the diagrammatic sketch. The DKS-3 has a static radial non-brinell capacity of 900 lbs. and a static thrust non-brinell capacity of 190 lbs. Capacities for the larger DKS-4 are 1100 lbs. and 240 lbs. respectively.

Non-Corrosive Soldering Flux

A new non-corrosive soldering flux for soft soldered joints is being marketed by the Mann Instrument Corporation, 10 Arrow St., Cambridge, Mass., under the name Solderux.

Solderux has the unusual property of being nearly as active at soldering temperatures as zinc chloride, which is highly corrosive, while at ordinary temperatures Solderux is quite inert and does not cause corrosion. Excellent joints on copper to copper, brass to brass, constantan to brass, and iron to brass are easily made with no corrosion of joints after exposure to a moist atmosphere.

The fluxing ability of Solderux at soldering temperatures makes it a valuable accessory to industry as well as to the small shop, household and laboratory. It is especially adapted to very fine work. Its non-corrosive properties permit its use upon very fine wires and upon such delicate parts as the control springs of electrical instruments. Solderux is available in 1 oz. jars.

"Concretdense"

To facilitate the repair of concrete floors in the machine shop, especially in places where the floors are likely to be saturated with oil, the Flexrock Company, 854 N. Delaware Ave., Philadelphia, Pa., is now marketing a product which, when mixed with the concrete, produces a water-proof concrete with almost impenetrable bores, which will bond so well with old concrete that the patching is more permanent, which sets in sufficient time so that the floor may be used within 15 hours after the patch has been made, and which provides a much more dense and consequently much more wear resistant concrete.

This product, known as "Concretdense," is a combination of chemicals

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No. 1 Capacity 0 thru 3/32" wire, $1.25
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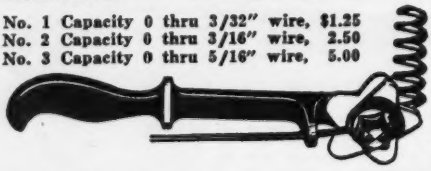
No. 3 Capacity 0 thru 5/16" wire, 5.00



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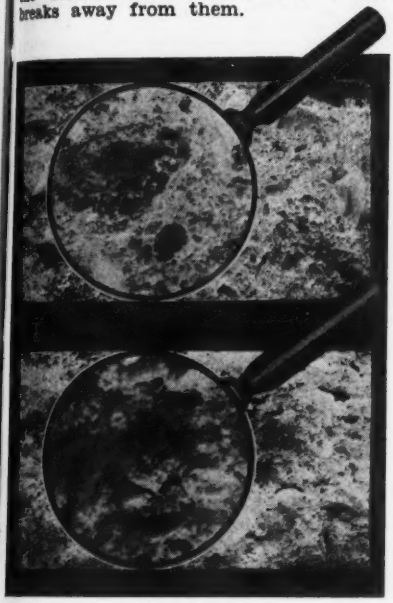
The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

HJORTH LATHE & TOOL CO. 12 BEACON STREET WOBURN, MASS.

which not only completes the hydration of cement but also produces such a tight grain that the structural strength of the cement is tremendously increased. Actual tests have shown that in an attempt to break a block of Concretdense, the stones shear before the cement breaks away from them.



The concrete shown in the upper illustration was mixed with Concretdense and required, to break it, 2½ times the compression strength required to break the plain concrete illustrated below.

The illustration shows two specimens of concrete, the top specimen made with Concretdense and the bottom specimen with plain water according to the method ordinarily used in making concrete. A 4-in. cube was made from each of these sections and each cube was permitted to dry for two days. At the end of this time the cubes were broken.

The power required to crush the cube in which the Concretdense was used was about 2½ times that required to crush the plain concrete. In breaking, the granite stones actually were sheared in the case of the Concretdense block, whereas the plain concrete block broke around the stones. The broken part of each of these blocks was magnified and photographed as shown.

Liquids cannot penetrate Concretdense. therefore the manufacturer claims that it lasts several times longer than concrete nothwithstanding the fact that this material creates a better bond to old concrete for patching purposes. During hydration, Concretdense creates an internal heat, in consequence of which it is excellent for cold weather concrete problems.

Smith Planetary Speed Reducer

Winfield H. Smith, Inc., 30 Eaton St., Springville, Erie Co., N. Y., has added a line of planetary speed reducers to the line of worm speed reducers manufactured by this firm. Ratios from 20:1 to infinity:1 are available, and efficiencies

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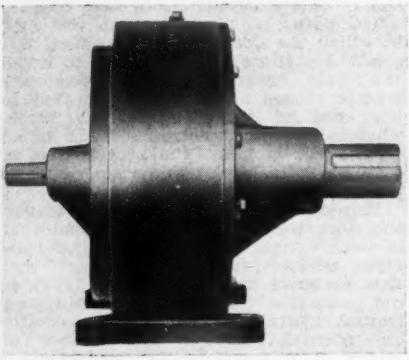
PARENT METAL PRODUCTS INC.
1703-15 Rittenhouse St. Phila., Pa

are reported as high as 94 per cent. Compactness and high efficiency are the outstanding features of the new unit.

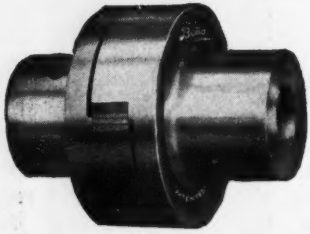


Smith Planetary Speed Reducer

Anti-friction bearings are used throughout and heat treated alloy steel helical gears insure quietness of operation and long life.

Bondtru Flexible Insulated Coupling

Charles Bond Company, 617-A Arch St., Philadelphia, Pa., has brought out a flexible insulated coupling which is said to be practically indestructible. The coupling consists of three parts, two metal flanges and one non-metallic insert or spider, all of which are of substantial construction. The flanges are provided with suitable metal lugs and the spider fits between the alternate sections. The non-metallic flexible insert acts as a shock absorber and insulator and the load is taken completely by the metal flanges in compression. The spiders can be furnished in either leather or cork composition for the smaller sizes, and in the larger sizes the spiders are made of leather only.



Bondtru Flexible Insulated Coupling

The coupling requires no lubrication.

The Stanoil "Sextette"

The Standard Oil Company of Indiana, 910 S. Michigan Ave., Chicago, Ill., has developed a new series of six lubricating oils to be known as "Stanoil", the difference in the oils being indicated by number. The six grades or Stanoil are said to combine qualities which make it possible for them to replace more than twenty-four other types of industrial oils.

The versatility of Stanoil is achieved by combining in each grade of Stanoil more desirable qualities than were incorporated in the oils which it is intended to replace. Each grade of Stanoil is a medley of fine qualities which enables the oil to do its work better and more economically.

The features of Stanoil are unusual high stability, excellent demulsibility, low carbon-forming tendency, excellent color, good viscosity index, and a low pour test. In the development of Stanoil the Standard Oil Company is leading correct lubrication back toward simplicity and reversing the tendencies toward oils of limited application.

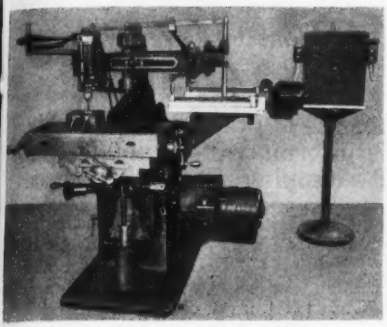
The application features of each of the six grades of Stanoil are outlined in a folder that is available upon request.

Marquette Model 3 H-A Three Dimensional Automatic Pantograph Unit

A three dimensional semi-automatic pantograph unit especially adapted for die sinking, engraving and profiling has been added to the line of engraving machines and cam cutting machines made by Marquette Mechanical Engineering Co., 16 W. 5th St., Erie, Pa. The machine is adapted for sinking dies and molds in the third dimensional direction as well as for flat work, and is especially intended for profiling and lettering.

The design of the machine is such as to facilitate the use of soft masters or molds, made of plaster or kindred materials, for the third dimension or for flat design. The tracer mechanism is so sensitive that accurate blue print designs can readily be followed, the entire reproduction being automatic. There is practically no pressure on the tracer, as the tracer moves easily on its bearings and a pressure of an ounce or so in any direction will cause it to make contact with the feed motor, which immediately

relieves the pressure. Semi-automatic work is possible by the use of a push button control immediately in front of the operator. Hand control also is pos-



Marquette No. 3 H-A Three Dimensional Universal Engraving Machine

sible. All controls are centralized and are within easy reach of the operator. The tracer and cutter head are mounted in a rigid housing, to facilitate accurate work at high production rates. The milling spindle is driven by

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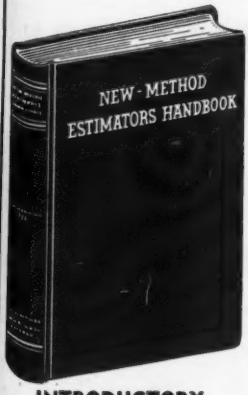

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Also gives . .. Production Costs per 1000 pieces—Time in split seconds—Minutes and hours—Conversion in decimals—Hourly production—Time required per 1000 at efficiencies of 50% to 150% for all labor rates per hour.

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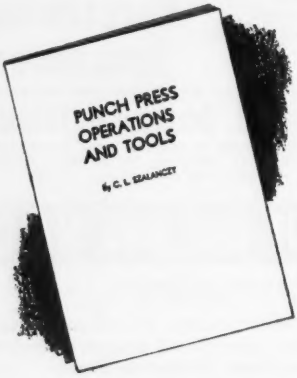

A new source of practical and highly valuable information for die designers and stamping plant executives.

Written by C. L. Szalanczy, this material first appeared as a series of articles in MODERN MACHINE SHOP magazine and received such widespread acclaim and attention that it is now presented in book form.

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a variable speed motor, thus avoiding gears but maintaining the necessary speed variation according to cutter diameters. Collets are provided for the use of straight shank cutters. Limit switches are provided to control the cutter in and out, left and right, or up and down, and feeds may be obtained within the capacity of the machine.

The working surface of the machine table is 18x8⅞ in. Length of carriage, 16½ in. Longitudinal feed, 14 in. Cross feed, 11 in. Maximum distance between spindle and machine table, 17 in. Number of spindle speeds, 10. Range of spindle speeds, 1800 r.p.m. motor, 1000 to 6000 r.p.m. With 1200 r.p.m motor, 666 to 4000 r.p.m. With 900 r.p.m. motor, 500 to 3000 r.p.m. With 3600 r.p.m. motor, 2000 to 12000 r.p.m. Net weight of machine without rotary table, 1650 pounds.

Tool Salvaging

Tool Salvaging; The Modern Method of Cutting Small Tool Costs. Many dollars can be saved through the reclaiming and reconditioning of worn cutting tools, according to this 16-page booklet, which is now being issued by National Tool Salvage Co., 3818 Beaubien St., Detroit, Mich. Great strides have been made in the practical development and scope of tool salvaging during the past 25 years, and the economies to be effected by this means are recognized by all the users of tools and cutters in any quantities whatever.

The book describes and illustrates the various types of cutters both before and after recutting, and describes the processes through which the cutters pass in process of reclamation. Figures show the saving that can be made by salvaging worn-out tools. Copy free upon request.

CHAINGRIP UNIVERSAL PULLERS. The use of the "Chaingrip" Universal Puller for removing gears, wheels, pulleys, pinions or bushings without injuring the equipment with which such parts are used is discussed in a folder that can be had by addressing Armstrong-Bray & Co., 303 Sheldon St., Chicago, Ill.

"There's One in Every Shop" *By Wesser*

THE GAS ATTACK
GOSH, HE'S HANDIN' THE BOSS A FOUNTAIN PEN NOW. THERE GOES OUR CHANCES FOR A RAISE THIS YEAR. I'LL BET ALL THE JUNK HE PEDDLES IS HOT STUFF!
OF COURSE YOU NEVER SAW OUR PRODUCTS ADVERTISED! YOU SEE, THEY ARE SO GOOD THEY SELL THEMSELVES. WE ARE THREE MONTHS BEHIND ON ORDERS NOW BUT I'LL RUSH YOURS AHEAD OF THE OTHERS. I KNEW THE MINUTE I SAW YOU THAT YOU WERE A MAN OF VISION—YOU KNOW A GOOD THING RIGHT AWAY— ETC., ETC!
OH SURE, WITH MY YEARS OF EXPERIENCE I CAN TELL YOUR MACHINES ARE OKEH JUST FROM WHAT YOU'VE SAID!
AND THEN THEY CALL ME A NUT!
CONTRACT
Burt Wesser

"ALNOR" BOYLE SYSTEM VELOMETER. This 4-page folder tells the story of a velocity meter which will indicate, directly on the scale, air velocities in feet per minute without the necessity of timing or making mathematical calculations. Held in the path of the air current, the air enters through the meter and actuates a mechanism comprising a vane to which a pointer is attached and which is controlled through control hair springs, a double pivoted, double jewelled movement and a magnetic damping system. The movement is housed in an attractive black holded plastic case 5¼x5¾x2⅜ in. in size and weighs approximately 2 pounds. Copy of this folder available by addressing Illinois Testing Laboratories, Inc., 146 W. Austin Ave., Chicago, Illinois.

ACORN CATALOG No. 202 OF HEAVY WIRE MESH PRODUCTS. This 48-page book, issued by Acorn Wire & Iron Works, 5912-18 Lowe Ave., Chicago, Ill., presents the many uses and advantages of Acorn wire mesh partitions, panels, guards, and other wire mesh products. The book contains a large number of illustrations of partitions, fences, doors, guards and other forms in which mesh is fabricated and describes each application. The efficiency and attractiveness of wire mesh guards for belts and moving parts are featured, together with the neatness, efficiency and simplicity of erection of wire mesh partitions in the machine shop. Copy free upon request.

LIGNUM-VITAE FACT FLASHES. Lignum-Vitae, although a wood product, contains certain characteristics which make it invaluable for use in certain types of metal construction. Lignum-Vitae Products Corporation, 100 Boyd Ave., Jersey City, N. J., is issuing a series of bulletins containing information regarding the characteristics of Lignum-Vitae together with descriptions of practical applications of this product, principally in the metal-working field. Manufacturing executives who wish to receive these bulletins as they are issued may have their names placed on the mailing list by addressing a request to this firm at the above address.

WAGNER BULLETIN SD-549. This bulletin, issued by Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo., is a bulletin of "Service Instructions for Capacitor-Start Induction-Run Motors." The bulletin lists the various difficulties which may arise in the operation of a capacitor motor, lists the various causes of each difficulty, and then describes the proper remedy and test. The bulletin should be of definite value to every maintenance engineer. Copy free upon request.

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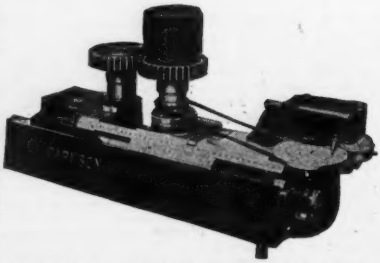

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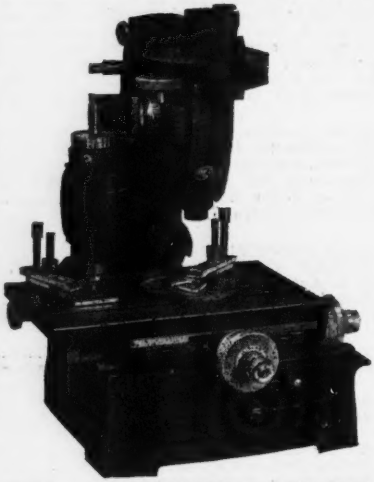

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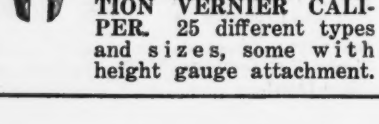

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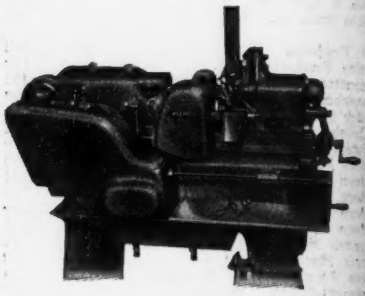

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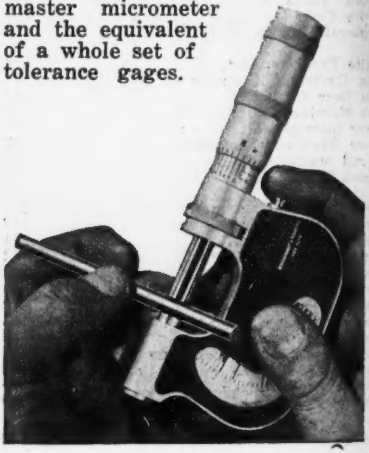

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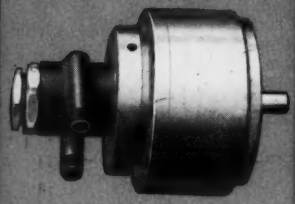

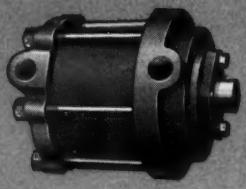

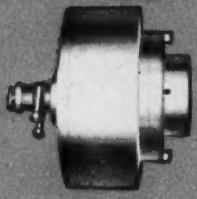

LOGAN cylinders

From the LOGAN line of standard air and hydraulic cylinders of many types, you can quickly select the correct cylinders to exactly meet your requirements. You can depend on them for utmost efficiency and economy.

When a cylinder problem arises in your plant it will pay you to get in touch with LOGAN. And remember, the LOGAN line includes equipment and devices for every work-holding requirement and many other purposes. Authoritative recommendations will be made by LOGAN engineers at no obligation.

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THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN *TAPERED ROLLER* **BEARINGS**

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Hardened and Ground Die Heads

--- unexcelled for production threading

THE new line of LANDIS Hardened and Ground Die Heads are especially well suited for production work.

The Linderme Machine & Tool Co., Detroit, Michigan, applied ⅞" LANDEX Hardened and Ground Heads to one of their double head threading machines. When cutting an 11/16" diameter, 16 pitch thread, 3" long, on eye-bolts forged from 1020 steel, they obtain 200 pieces per hour. The threads are finished from rough forgings and held to a limit of .003" on pitch diameter.

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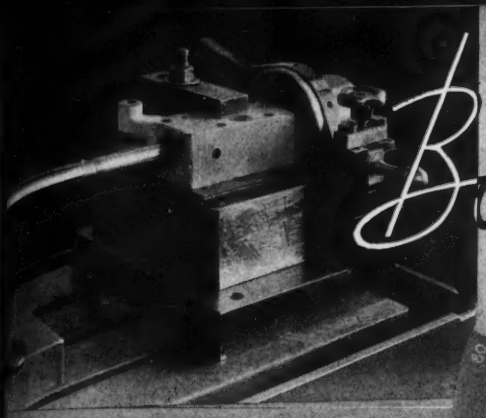
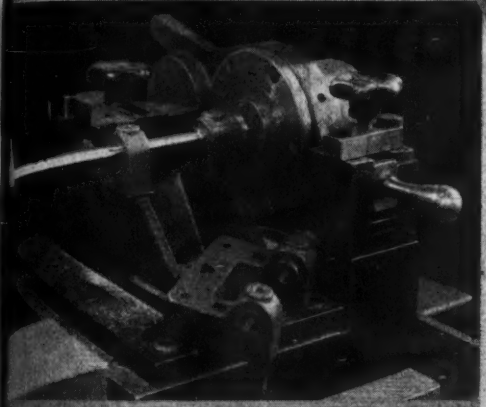
LANDIS MACHINE CO.

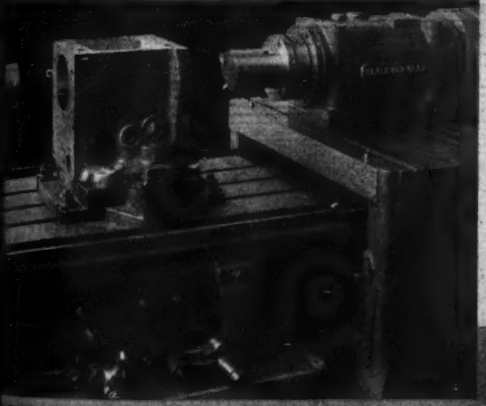
WAYNESBORO, PENNA.



Iron Valve Body with hole 1¼" diameter and 7" long. Previous time 22.4 minutes. Bore-Matic time 5 minutes.



Iron Bracket where holes must have perfect alignment. Previous time 18.2 minutes. Bore-Matic time 2.7.



Bore-Matic

AVERAGES 82% TIME-SAVING ON 22 DIFFERENT PARTS

MEETING the accuracy and quality required in today's products must necessarily demand the latest methods of manufacturing. Not only do Heald Bore-Matics meet the closest tolerances in size, alignment and required position of bore with other points, but a careful check at one machine tool manufacturer's plant where the lots run from 25 to 50 pieces, shows the Bore-Matic produced a saving of from 3 to 79 minutes per piece over previous methods.

The work consisted mainly of cast iron and bronze gears, pulleys, bushings, bodies, brackets, cylinders and like work, and the operations were boring and facing. The tolerances for roundness and straightness ranged from .0001" to .0002" and for size .0002" to .0005".

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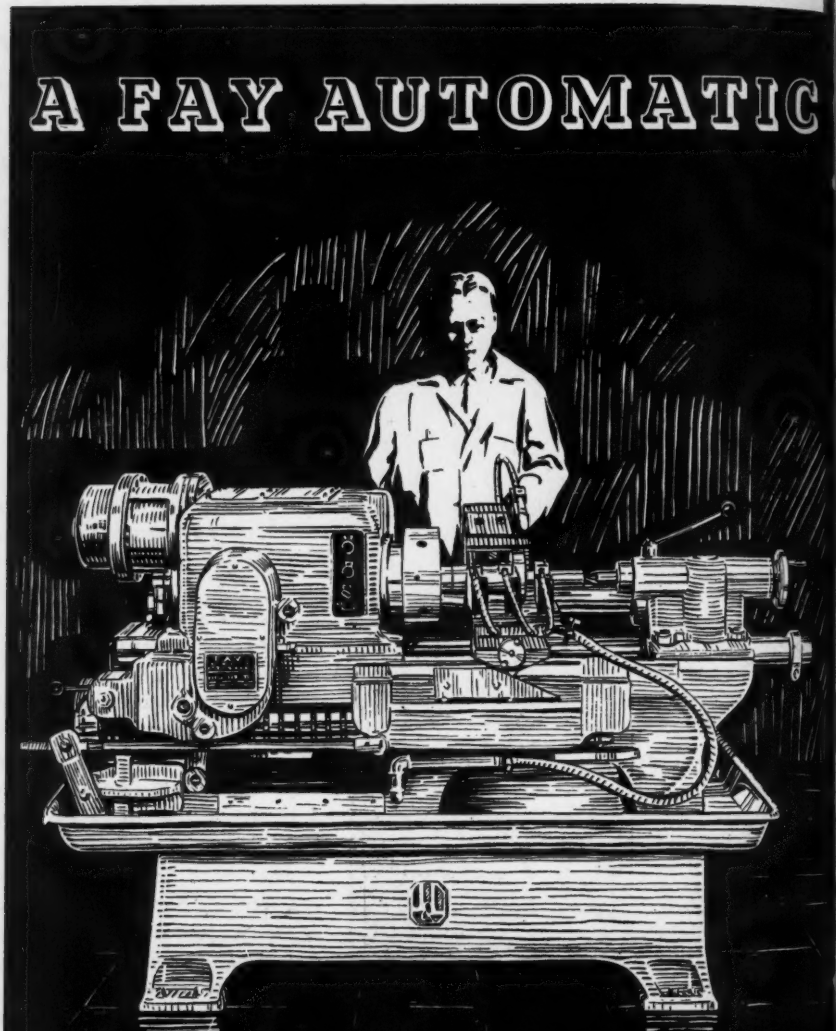

FOR LIGHTER WORK

THE 8 INCH J&L FAY AUTOMATIC

Let's have a look at the baby of the Fay family—the 8″ machine.

Although built for lighter work, the 8″ Fay Automatic Lathe incorporates all the advantages found in the larger sizes of the Fay Automatics. It is a flexible, universal machine completely automatic in cycle. It may be used for machining washing machine and refrigerator parts, valves, valve stems, and bushings; small shafts similar to those in automobile starters and generators; small pistons and similar parts.

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The 8″ Fay is a "baby" in size only—service has proven it to be a rugged little veteran.

JONES & LAMSON MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

The tool maintenance GANG

likes it...

YOUR tool maintenance gang will like the Cincinnati Cutter Grinder, because it is so easy and convenient to operate. Improved controls and adjustments enable them to do many sharpening jobs 15 to 25% faster, and incidentally to quickly end the clamor of the machine set-up men when a sharp cutter is required in a hurry. Unusual flexibility permits a large variety of milling cutters, reamers, hobs, form tools, etc., to be easily and accurately ground.

CINCINNATI

Correctly sharpened tools, quickly available, are one of the basic requirements necessary to keep your machinery working in a lock-step pace with your production schedule. The Cincinnati No. 2 Cutter and Tool Sharpening machine fulfills this requirement. Accurate cutting and clearance angles, the very essence of a free cutting tool, are quickly and easily obtained on this machine.

May we suggest that you investigate the performance of the Cincinnati No. 2 Cutter and Tool Sharpening Machine? Write for the Facts on Features booklet M-647.

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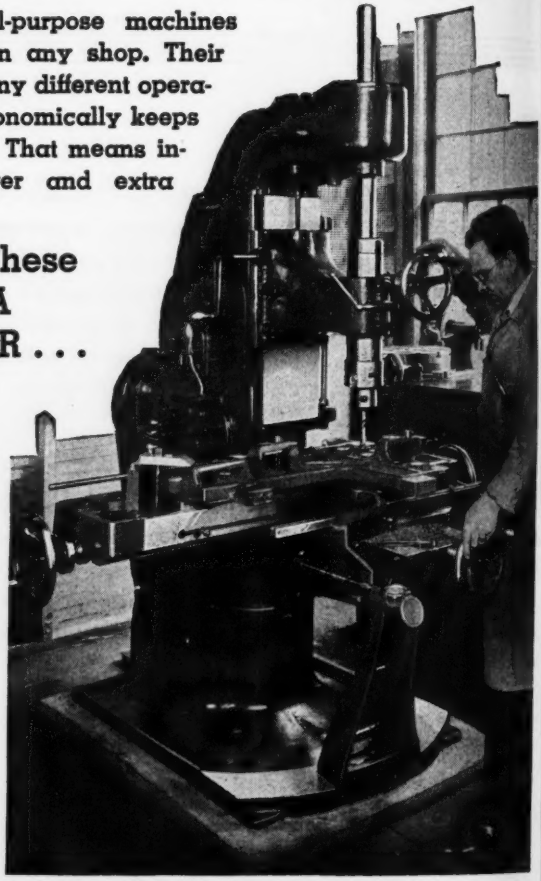
CINCINNATI, OHIO, U. S. A.

"There's *always* a job FOR THE KNIGHT MILLERS"

THESE modern, all-purpose machines won't stand idle in any shop. Their ability to handle so many different operations efficiently and economically keeps them busy constantly. That means increased earning power and extra profits for you.



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• ST. LOUIS, MISSOURI •

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Roughing and Finishing

THIS new Original Fellows Cutter—known as the gap type—fulfills two functions, in that separate rows of teeth on the same cutter rough and finish the gear in one operation. There are several advantages to this method of cutting gears.

1. **A separate set of teeth is used for roughing and finishing.**
2. **The position of the work is not disturbed after the roughing operation.**
3. **Only one handling of the work is necessary.**

Other advantages are greater accuracy and increased production. It is to your advantage to know more about this improved method for cutting gears. An instructive circular describing the process is awaiting your request. Write.

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·GEAR SHAPERS·
AND *"Original Fellows"* CUTTERS

THE FELLOWS GEAR SHAPER COMPANY
SPRINGFIELD, VERMONT — 616 FISHER BLDG., DETROIT, MICHIGAN

SEND FOR THIS BOOK

It shows a new type of abrasive belt of lapless construction. Used on steel, brass, bronze, aluminum, wood, etc. More economical to use than built up rag bufts.

Send for your copy of this new book today.

Power Finishing Beats Human Muscle

This new finishing and polishing equipment will turn out far better work and much more of it than hand methods. The polishing drum consists of an expanding rubber core mounted on an arbor, with two compression washers and a nut. An endless abrasive belt or sleeve is slipped over the rubber core and the latter is expanded by tightening down the nut, holding the sleeve solidly in position. The compression washer is recessed to permit reaching close corners, and to prevent any possibility of damage to the work from the nut.

Our new circular will give you complete information on this new method of finishing. We will be glad to mail you a copy.

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DIVISION NILES-BEMENT-POND CO.
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DIAMOND SURFACE GRINDING MACHINE

TYPE G 8-24

Built fast and rugged for economical production grinding—with controls so convenient, and operation so easy, that it is equally suited for tool room work. The G 8-24, like others in the Type G series, features the Diamond pioneered construction of head and upright all in one casting—giving wheel spindle the rigidity which insures accurate grinding. Takes work 8" wide by 24" long.

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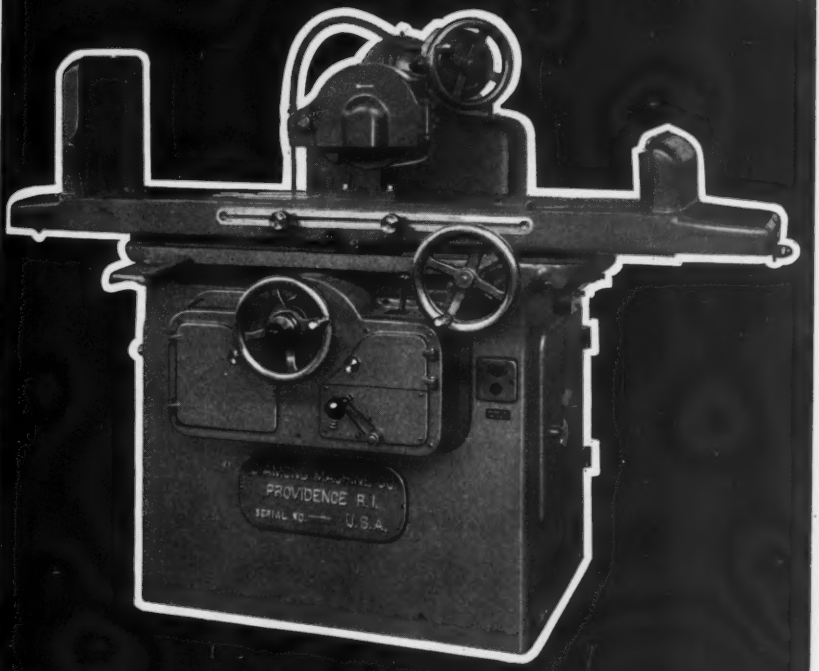

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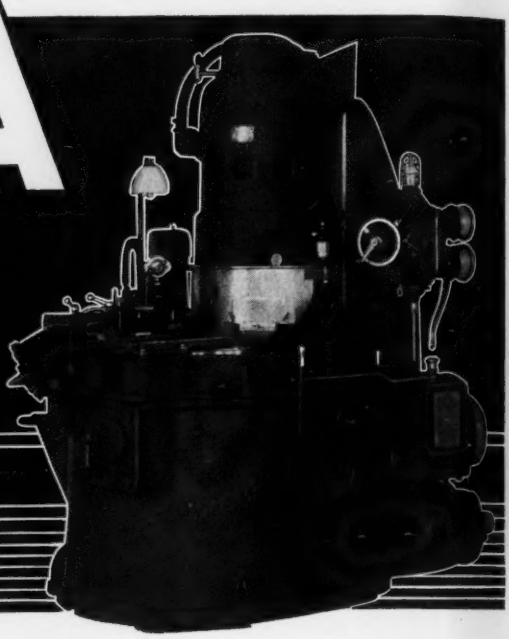

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THE BLANCHARD MACHINE COMPANY

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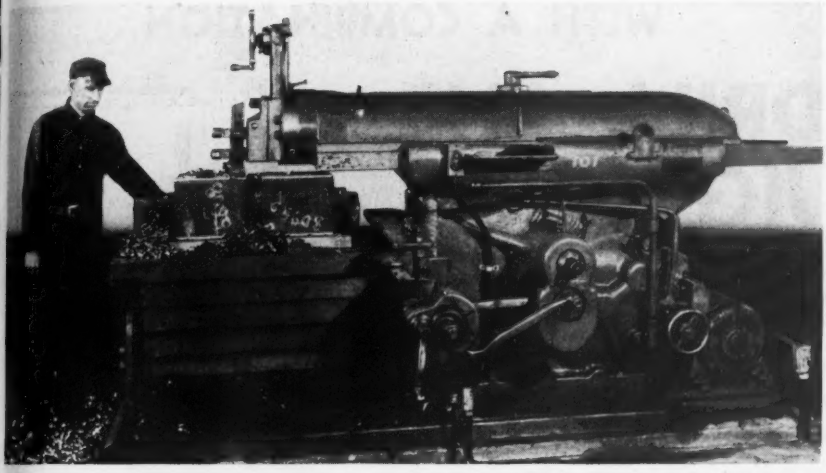

SUPER DREADNAUGHT SHAPER
WEIGHT 12100 LBS.

Illustration shows OHIO 36" Super-Dreadnaught Shaper, equipped with table 30" wide by 48" long, machining alloy steel heat treated die blocks 12"x12"x16" with a shore scleroscope hardness 50 to 55.

Size of the shank planed across on the 12" width of the blocks is 6½" at the top, 2 1/32" deep with 7 degree angle. Accuracy was held to within .005". Machining also included the planing of the surface and matching edges of the die blocks, removing ¼" material from the surface and squaring the sides.

A total of 237½ cubic inches of stock was removed in seventeen hours.

The OHIO Super-Dreadnaught Shaper illustrated is particularly adapted for heavy work usually found in forge shops, die shops, locomotive shops, etc. This machine can be equipped with special fixtures for machining locomotive driving boxes including shell fit, cellar fit, shoe and wedge fit, crossheads, etc.

Bulletin No. 52-A Sent On Request

THE OHIO MACHINE TOOL CO.
KENTON, OHIO

Manufacturers of Shapers since 1887 and Horizontal Boring Mills since 1926.

FOSDICK *leads again*

WITH A COMBINATION

DRILL AND JIG BORER

NEW—LOW PRICED

A general utility tool for making production parts that cannot be jigged and for making jigs, fixtures, etc.

SPECIFICATIONS:

This drill is equipped with twelve spindle speeds from 60 to 1500 r.p.m. and nine feeds from .0025" to .020", having a spindle travel of 12" with a working capacity of 27" from spindle to table.

Compound jig boring table furnished in 30" size. Table is positioned by measuring rods, micrometer and dial indicator. Table can be accurately located in both directions, within .001".

Write today for information on the new FOSDICK Drill and Jig Bore.

FOSDICK MACHINE TOOL COMPANY

CINCINNATI OHIO

CONTINENTAL INTERCHANGEABLE COUNTERBORES

provide Balanced Indestructible Drive

Long life, rapid change-over, and consequent low tool cost and operating economy, are direct results of Continental's exclusive driving principle. Drive is by integral formed lugs with annular bearings on each end of the drive, thereby eliminating runout of the cutter.

Standard cutters are engaged and disengaged by rotating a quarter-turn by hand. Holders will drive either right or left-hand cutters. Cutter design permits maximum chip clearance with no sacrifice of efficiency. Continental Counterbores are also furnished with taper drive. Both standard and special holders and cutters can be provided with the Continental drive to meet individual requirements. Continental Counterbore Catalog upon request.

EX-CELL-O AIRCRAFT & TOOL CORPORATION DETROIT, MICHIGAN

COUPON

Please send me descriptive literature on XLO products as indicated below:

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

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City and State _____

CINCINNATI BICKFORD

SUPER SERVICE
HIGH-SPEED ALL-GEARED
RADIALS

CINCINNATI BICKFORD Super Service Radial Drills installed in your shop, assure you of getting more holes per dollar invested. They are modern tools in every respect, performance proved and thoroly dependable.

The new High-Speed 3' and 4' Radials, for example, provide a speed range to suit your work. Spindle Speeds as low as 60 r.p.m. or as high as 3500 r.p.m. are available. All speeds and feeds are changed by sliding gears with single lever control at the head. *Balanced head and arm* moves on anti-friction bearings for the ultimate in fast, easy handling.

Write for latest catalogs.

THE CINCINNATI BICKFORD TOOL CO.
OAKLEY, CINCINNATI, OHIO, U. S. A.

A PRECISION GRINDER FOR SMALL DRILLS

. . . rounding out the complete line of Sellers tool room equipment. Produces the famous "Sellers Production Point that Pays a Profit". A modern grinder for high production even in unskilled hands. And at a price within reach of every shop. Ask for Bulletin S-5

WM. SELLERS & COMPANY, INC.
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ACCURATE
EASY TO
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SELLERS
1848

Nothing can be so Profitable as a clever Workman and a fine Tool

This---

No. 1½ SURFACE GRINDER

will open the door to bigger and better earnings.

HAND Operated only, because this is the most economical way of surfacing single pieces, gages, etc.

Featuring built-in motor on Spindle, large capacity, and the highest degree of precision.

Capacity - 15"x10"x12"
Wheel - 12"x½"

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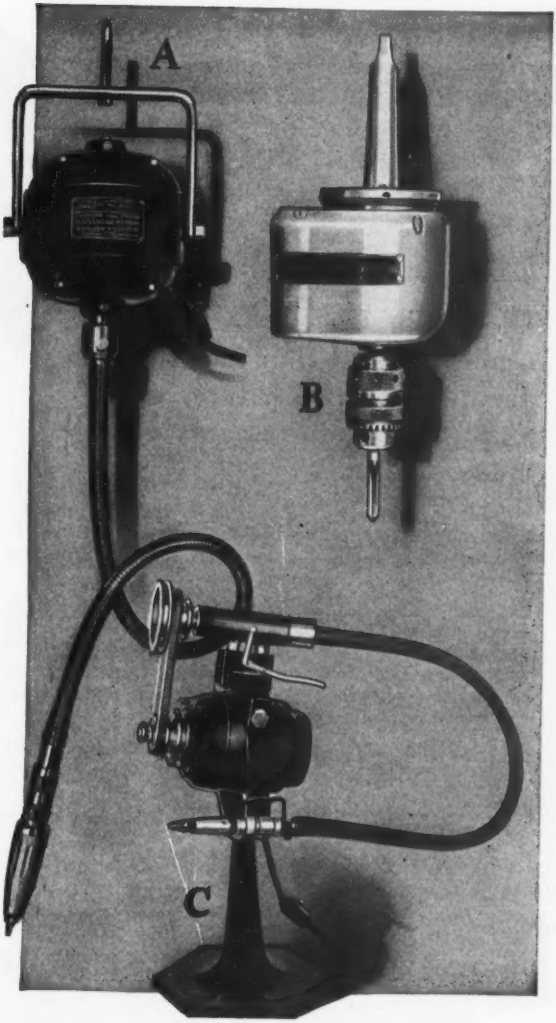
ABRASIVE MACHINE TOOL CO.

8 DUNELLEN ROAD EAST PROVIDENCE, R. I.

Let these Tools Help you



A The "Jarvis Setter," a screw driving and nut setting unit available in various speeds, ball bearing throughout with the adjustable Niedhammer ball socket clutch.

B The Jarvis "Biax" Tappers. All ball bearing, forward and reverse friction, double reverse speed.

C The "Multi-Jarvis," Multiple speed flexible shaft unit for grinding, polishing, sanding, rotary filing, etc. Speeds from 1000 to 16000.

Get information on the following JARVIS-BIAX *Tools — Write today.*

Tapping Attachments: (1) All ball bearing, forward and reverse friction; (2) Positive forward and reverse; (3) Positive with adjustable friction slip chuck.

Quick Change Chucks and Collets.

Niedhammer Screw Drivers and Nut Setters.

Flexible Shaft Machines, multiple speed, ¼ to 3 h.p.; single speed, ⅛ to 3 h.p.

Flexible Shafts Complete, ready to attach to any motor.

Flexible Cores and Casings, in mill lengths and for replacements.

Flexible Shaft Screw Driving Machines.

Write for Catalog

JARVIS BIAX

The Chas. L. Jarvis Co., Gildersleeve, Conn.

do you know

the facts about money-saving LIBBY LATHES

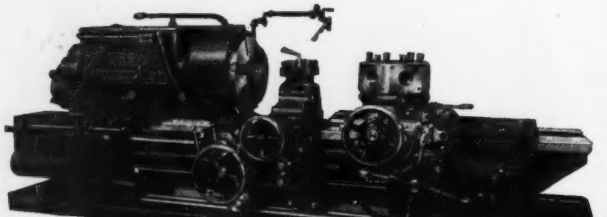
FACT No. 3 . . .

The LIBBY UNI-FLEX is designed and built for the demands of the future, as well as the requirements of today.

● Built into every LIBBY LATHE are the inherent power and rigidity which provide reserves of strength and service probably greater than your requirements will ever demand.

Extremely powerful direct motor drive and exceptional rigidity of tool post and turret, enable LIBBY operators to increase both spindle speeds and feeds when using Tungsten Carbide Tools. Thus, increased production is easily obtained without endangering the machine or its equipment.

Write today for complete information on these modern machines.



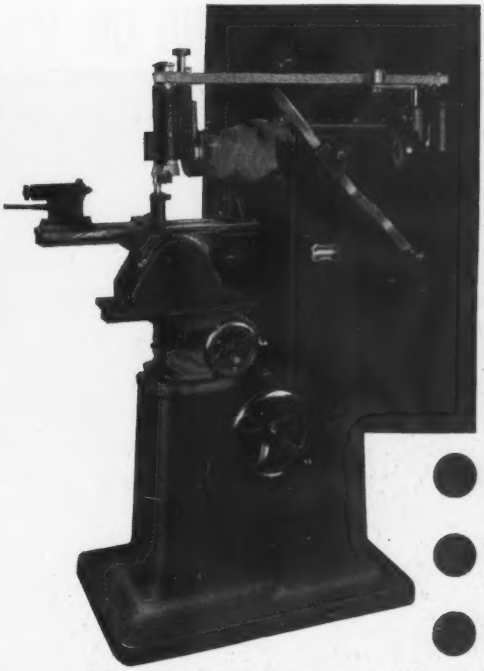
957

The International Machine Tool Co.

INDIANAPOLIS INDIANA

Libby UNI-FLEX

A NEW UNIVERSAL TOOL and CUTTER GRINDER by OLIVER of ADRIAN



A new machine—A new principle — Accurate, Simple, Convenient. Wide application with a few simple fixtures.

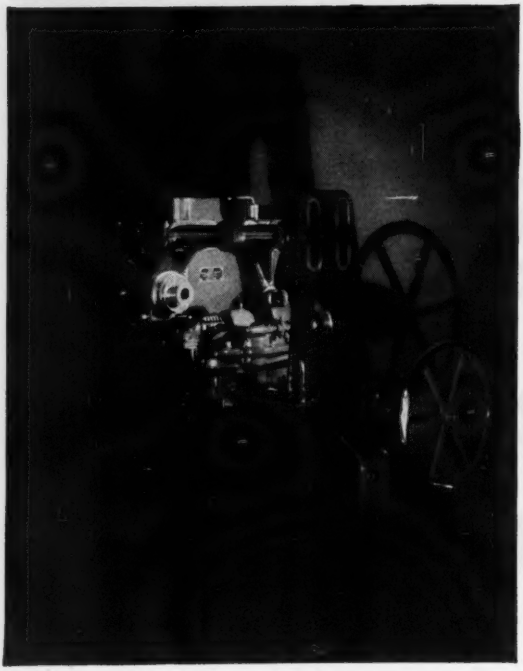
A life saver for cutters and reamers—A production aid in your plant—Your tool room will profit. Send for bulletin with details—specifications — application photographs of this latest addition to the Oliver Line of Tool Conditioning Machines and you will be agreeably surprised with the reasonable price.

New design—work is held stationary in a universal fixture arranged to receive a few simple tool holding fixtures. Grinding wheel traverses the tooth being ground. Clearance obtained by tilting grinding wheel. Angle indicated by direct reading — no computation necessary. Cutter teeth can be backed off without changing setting of work. Work always in direct view—natural standing height for operator. All working parts above flow of grinding dust.

We also build the Oliver Twist drill grinder, face mill grinder, tap grinder, precision tool grinder, die making machine and drill point thinner. Special tool grinding machinery.

OLIVER INSTRUMENT COMPANY
1430 EAST MAUMEE STREET .:. ADRIAN, MICHIGAN

MAXIMUM HOBBING ON MINIMUM INVESTMENT



BARBER-COLMAN
Number 12
HOBBING MACHINE

Rotation of a formed cutter known as a Hob against a revolving work-piece is the most rapid, efficient and economical method of cutting gear teeth, splines, sprocket teeth, square shafts, ratchet teeth and other forms, on a manufacturing basis. The Barber-Colman Number 12 Hobbing Machine provides accurate hobbing on a relatively small investment because it has belt drive, is simple in construction, easy to operate, reliable and durable. Certain special units and accessories; such as motor drive, rapid traverse unit, stabilizer, extra long bed, vertical feed, 90° hob spindle, and automatic oiling system; available as extra equipment, are not included in the list price of the machine because they are necessary only for extra long work, worm gears, extremely steep helix angles, or other special requirements. Investigate! Write, today, for details of this machine and our Complete Hobbing Service.

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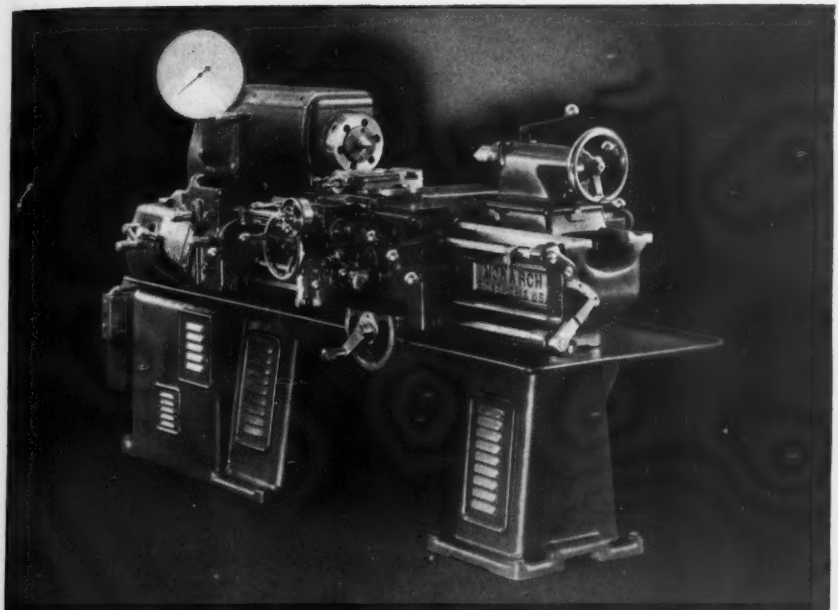
PRODUCTS

MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant ROCKFORD, ILLINOIS, U. S. A.



MONARCH ANNOUNCES THE NEW HYDRAULIC MULTI-SPEED LATHE

MONARCH has done the unusual again—has applied Hydraulic automatic speed changing to the spindles of lathes for the first time! This new drive has already been successfully used on both tool room and production lathes in many industrial plants and has made really tremendous savings.

Regardless of the number of spindle speeds you may desire—100 . . . . 500 . . . . 1000 or more!—you can secure them instantly on this new Monarch machine. Spindle speed changes are made automatically or manually at the apron of the lathe, the operator's working position. (A tachometer indicates the speed at which the spindle is turning—and can also show the surface cutting speed on the various diameters being turned.)

The new Monarch Hydraulic Multi-Speed Lathe can be used on production jobs where the diameter being turned changes constantly or frequently. It is ideal for use . . . . . .

- On all lathes used for facing work.
- On all lathes where multiple diameters are turned, where a saving of time will be made by automatically changing spindle speeds to maintain the desired surface cutting speed on all diameters.
- On Engine lathes and Tool Room lathes where a wide variety of diameters are being turned and where an infinite range of spindle speeds . . . . instantly available to the operator from his normal working position at the apron . . . . will lessen his fatigue and result in a bigger day's work.

• WRITE FOR THE HYDRAULIC MULTI-SPEED LATHE BULLETIN.

Monarch Machine Tool Company,
Sidney, Ohio, U. S. A.

New York Sales Office: 413 Graybar Building
Chicago Sales Office: 622 W. Washington Blvd.

MONARCH UNITS COVER THE TURNING FIELD

GREATER BEARING SURFACE

LE BLOND

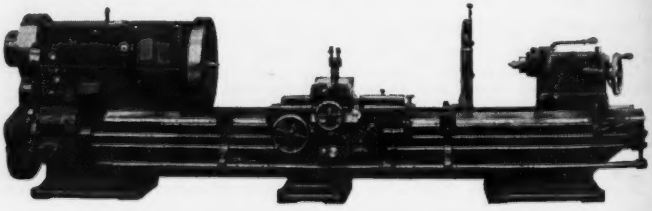
That is one of the advantages of the LeBlond heavy duty semi-steel nickel bed with the improved compensating front vee way. It is a distinct improvement over the universally-used inverted V ways, as the design not only counteracts the tool forces in the most efficient manner, thus eliminating climbing, but it allows four to five times greater bearing surface.

Write for descriptive literature.

The R. K. LeBlond Machine Tool Company

CINCINNATI, OHIO

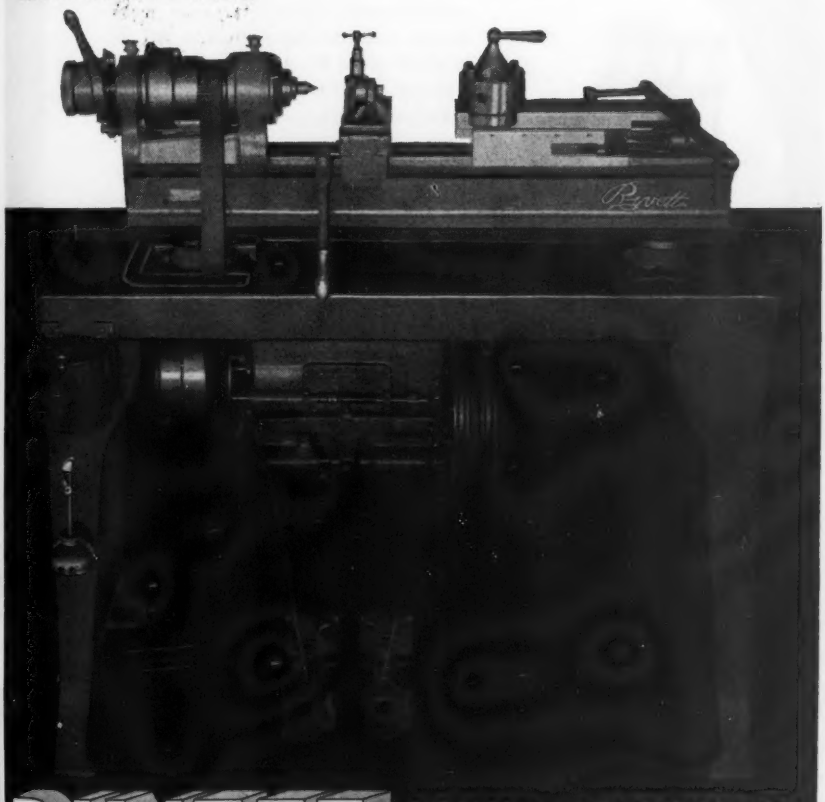
30-inch Heavy Duty Engine Lathe



RIVETT Anti-Friction Bench Lathes

Ball Bearing and Roller Bearing Spindles

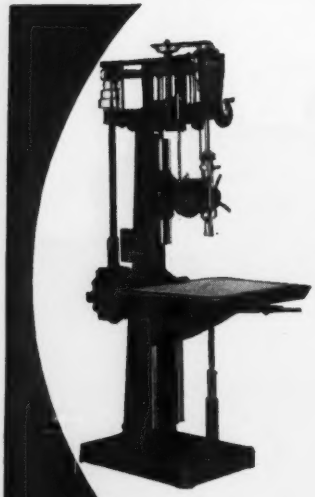
The earning power of an anti-friction bearing lathe with Speed Box Drive may well be twice, or three times that of an old type counter—or jackshaft driven job.
Spindle is trouble-proof under all conditions.
Speeds are: Ball Bearing, maximum 4600 R. P. M.
Roller Bearing, maximum 2300 R. P. M.
Endless belt is replaceable in one minute.
Motor runs continuously.
Speed Box gearing and multi steel disc clutch are splash lubricated.
Brake is automatic and stops spindle instantly.
Lever Chuck Closer has hardened steel rollers to withstand severe continuous duty.
Double production. No lost time.
Bulletins 505-BB and 505-RB.



RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

Smooth • Fast Drilling

NEW BALL BEARING SPINDLE SENSITIVE DRILLING MACHINES



WITH a new redesigned head, No. 2 Footburt Sipps represent a still greater value than ever in sensitive drilling equipment. All the old reliable Sipp features are retained with a new precision ball bearing spindle, more efficient idler arrangement and better appearance. Improved power feed and new built-in tapping attachment are also available. The Footburt Sipp Sensitive Drills have a drilling range from No. 80 to 1¼" in cast iron and are made with from one to eight spindles and various overhangs. May we quote on your requirements?

FEATURES

Full ball bearing spindle—automatic idler—quick speed changes—solid cone pulleys—straight drive belt—four speeds with standard constant speed motor.

THE FOOTE-BURT CO.
CLEVELAND, OHIO
Detroit Office: 4-151 General Motors Bldg.

FOOTBURT
SENSITIVE DRILLS

A 1936 PRODUCTION LEADER

. . . *Particularly Advantageous for Milling with Formed Cutters in Steel*

Investigate

this compact, powerful manufacturing type milling unit, capable of establishing new production rates on both long and short run work.

Write for details.

Brown & Sharpe Mfg. Co.
Providence, R. I.

The NEW *Electrically Controlled* BROWN & SHARPE No. 12 PLAIN MILLING MACHINE

BIGGER PROFITS

on your

SMALL PART MILLING

with the

NICHOLS

HAND MILLER

SPECIFICATIONS:

Longitudinal Feed 10", Transverse Feed 7".

Vertical Feed of Knee 13½".

Vertical Movement of Head 4½".

Spindle Nose New Milling Machine Standard Taper 3½" to the Foot.

Spindle Speeds—100, 200, 600, 1200 R.P.M.

Write for Descriptive Bulletin and Prices.

The NEW NICHOLS Hand Miller cuts costs on all small part milling, regardless of lot size, far below the costs on heavier equipment.

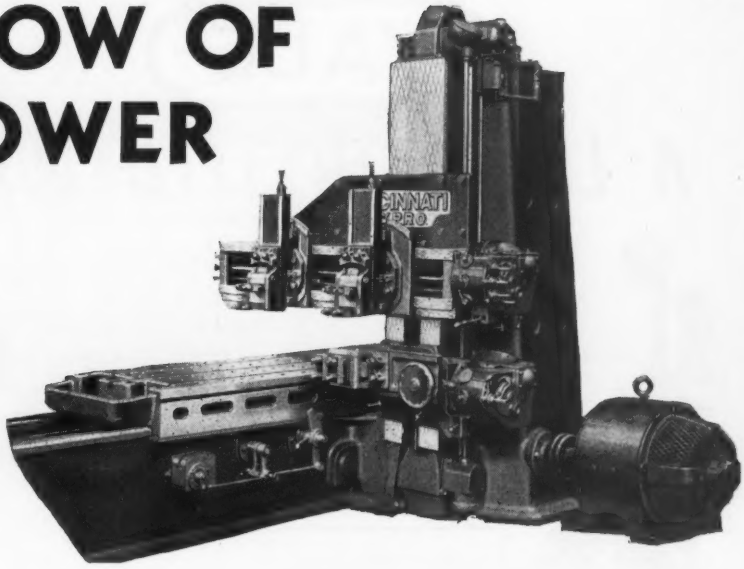
Easy and quick to set up and operate . . . the "NICHOLS", at the same time, has the accuracy, power, simplicity, and ruggedness which make it highly productive and efficient on a wide range of operations.

Finest workmanship and construction, plus advanced design in the NICHOLS Hand Miller assure maximum production and "BIGGER PROFITS" on all your small part milling.

MANUFACTURED BY

W. H. NICHOLS WALTHAM, MASS.

SMOOTH FLOW OF POWER



Under the heaviest cuts . . . and fastest speeds . . . the CINCINNATI HYPRO Planer delivers power to the cut smoothly and evenly thru its advanced All Steel Combination Herringbone Drive. Results . . . finer finish and maximum accuracy over an indefinite period.

Learn more about the long list of superior features in CINCINNATI Planers, Boring Mills, and Planer Millers . . . Planers from 22" to 120", both Double Housing and Openside. Write for catalog and for the location of the machine, now in operation, nearest you.

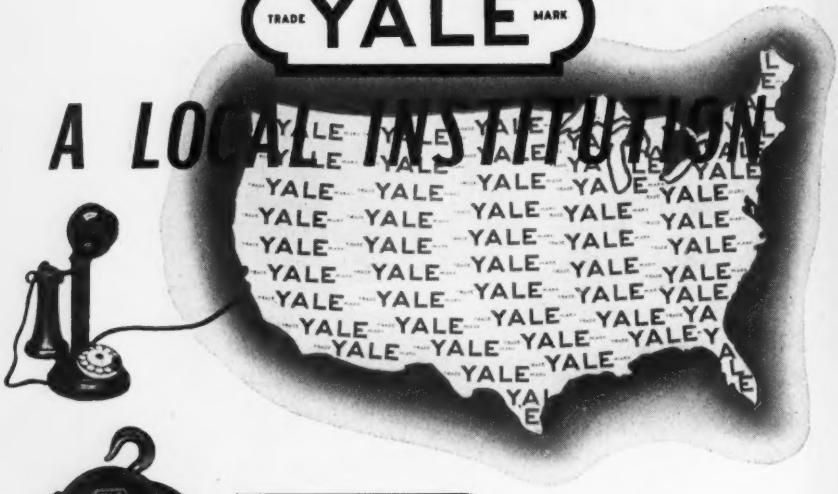
THE CINCINNATI PLANER COMPANY

CINCINNATI, OHIO **U. S. A.**

OUR SALES POLICY MAKES

TRADE YALE MARK

A LOCAL INSTITUTION



A Yale Distributor is no Further Away from you than your Telephone

Obviously, there cannot be a Yale factory in every industrial center. There is, however, an Industrial Supply Distributor in your locality who recommends and sells Yale Chain Hoists and allied equipment marked with this world-famous name.

Yale distributors are selected because they are business leaders in their communities. They prefer to sell Yale products because they know the advantages of supplying to their customers the highest quality, efficiency and dependability in hoisting and conveying equipment.

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"EEL-SKID" OIL

for your "ROCKWELL" Hardness Tester Will Prolong Its Life And Precision

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½ pint can $1.50
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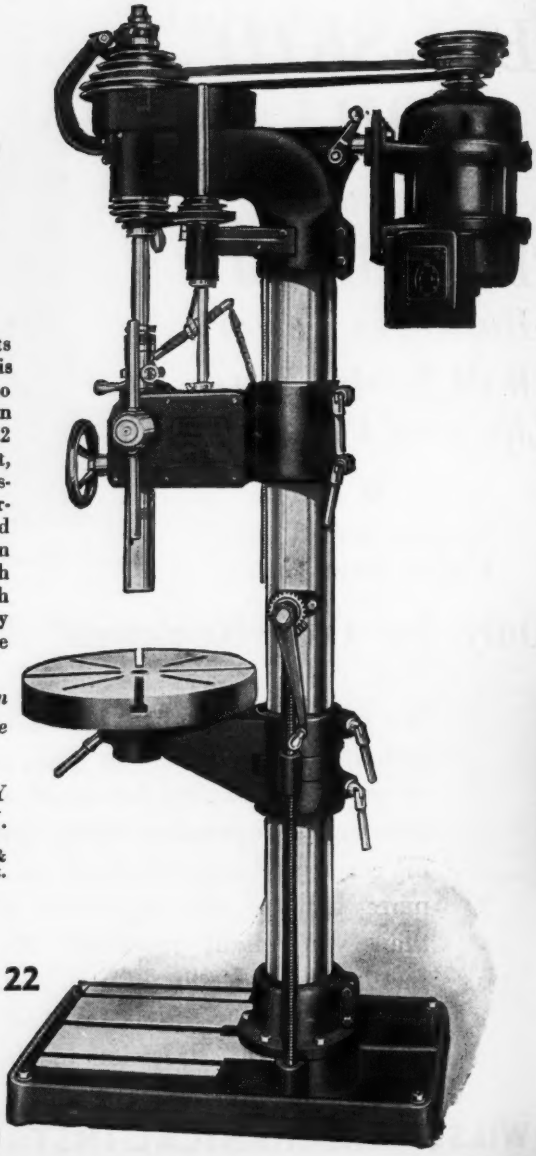
Only for the "Rockwell" Hardness Tester

We now offer to our "ROCKWELL" users a *special oil*, slow to dry or gum, good when cold or warm, that makes for speed, smoothness and accuracy of operation when applied to elevating screw and capstan wheel nut. It does much more for the nice operation of the machine than you might imagine. It's an important factor, else we should not devote this whole advertisement to it. "Eel-Skid" oil has been well tried out. Precision machines need care.

WILSON MECHANICAL INSTRUMENT CO., Inc.

Concord Ave. and E. 143rd St. New York

Put this accurate, fast drill to work



If you want to cut your costs on drilling operations, put this husky Buffalo No. 22 Drill to work! Designed for modern work requirements, the No. 22 is fast, accurate, convenient, safe—powerful. Every necessary feature has been incorporated in it—yet frills and special requirements have been omitted. Thus you get a high calibre machine tool at a much lower price than is ordinarily necessary on drills of like specifications.

Write today for 8-page bulletin No. 2989 and prices on the No. 22 Drill.

BUFFALO FORGE COMPANY
388 Broadway Buffalo, N. Y.

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

The "Buffalo" No. 22 drill costs less to buy - less to operate

● **Capacity**—The model B-225H Vertical Hydraulic Feed NATCO Driller shown at the right is built for a variety of applications. It has a rated capacity of one 1¼" drill in steel —or an equal capacity in a larger number of smaller drills.

● **Hydraulic Feed—Simplified Control**—This machine is arranged with a semi-automatic hydraulic feed. The simplified control permits instant and positive control of the head under all conditions.

● **Adjustable Feeding Rate and Feed Lengths**—The feeding rate is easily adjusted as required by means of a valve. The length of the rapid traverse and feed strokes are adjusted by valve trip dogs which are located on the right hand side of the head.

● **Variety of Heads and Spindle Speeds**—This machine may be arranged with a flat slide for the mounting of a single spindle hi-duty head, a slow speed head for boring operations, or a fixed center multiple spindle drill head for high production work. This machine may also be arranged with three different sized adjustable multiple spindle heads equipped with either 8 or 16 spindles. A variety of spindle speeds are provided for all heads.

● **Solid Built-in Table or Adjustable Table**—Either a solid built-in table or an adjustable table can be provided. Both types are arranged with a wide coolant channel and coolant return.

Because of its great flexibility and its simple sturdy design —this machine has proved itself to be a valuable piece of shop equipment.

Consider the features

of this NATCO Multiple Driller . .

Install One Today and Cut Drilling Costs

● The machine shown may not fit in your shop—yet among the many types and sizes there is one that will fit your particular jobs. Let NATCO engineers aid you in coming to a practical and profitable solution of your "hole problem." They are ready and willing to make a complete survey of your drilling, boring and tapping operations without any sort of an obligation on your part. Call a NATCO representative—do it today.

● Chicago Office: 2009 Engineering Bldg., 205 West Wacker Drive. Detroit Office: 409 New Center Bldg. Factory and Home Office: **The National Automatic Tool Co., Richmond, Indiana, U. S. A.**

NATCO Drilling, Boring, and Tapping Equipment

THE

Avey

HIGH DUTY DRILLING MACHINES

REALLY SENSITIVE

Available in One to Six Spindles

Through years of long experience this machine has proved itself a favorite, among many prominent and large production shops, for high speed sensitive drilling.

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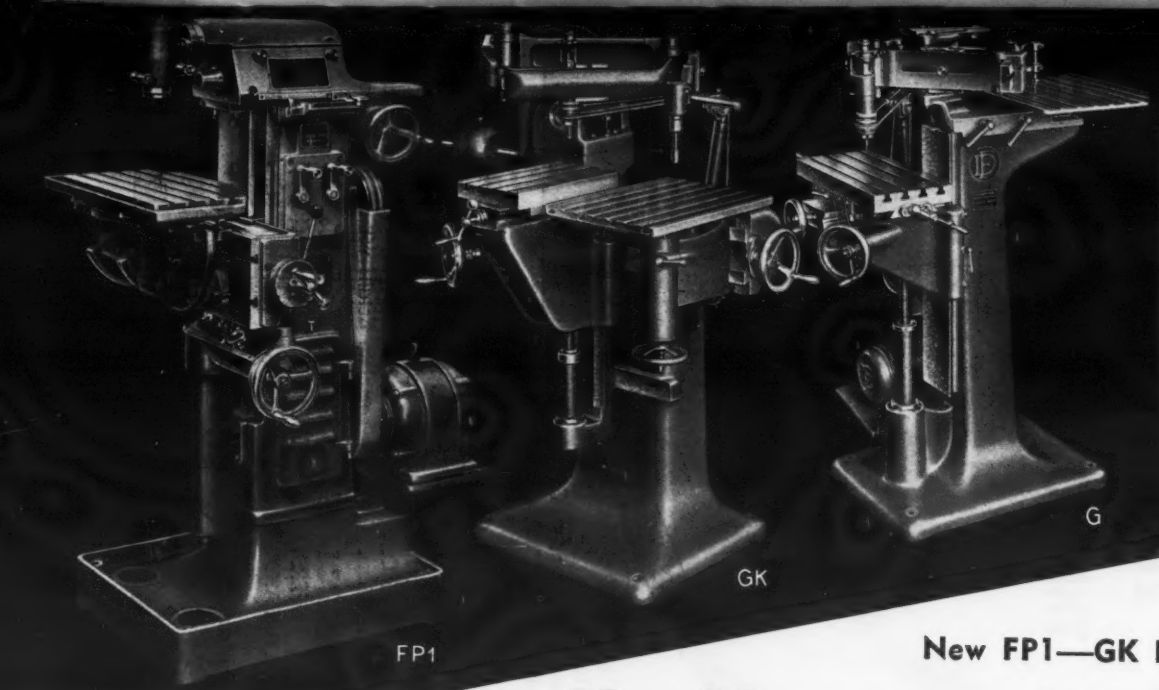
The AVEY DRILLING MACHINE Co.

CINCINNATI



New Machines and Modern Methods

Send for

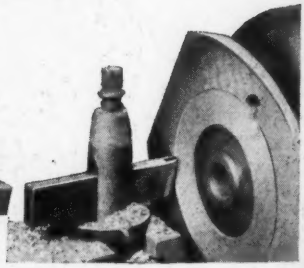
New FP1—GK booklets dealing with

New Machines and Modern Methods

in the construction of tools, jigs, molds, and dies, profiling, engraving. Single lip cutters for profiling, die and mold milling, engraving.

H. P. PREIS ENGRAVING MACHINE CO., 153 SUMMIT ST., NEWARK, N. J.

WHY USE 20 TOOLS TO DO THE WORK OF ONE?



Twenty times the life of ordinary tools is not unusual performance when you use Carboloy tools. A recent analysis of 100 jobs shows the following ratio of Carboloy tool life versus ordinary tools on the machining of various metals: Cast iron—29:1, Aluminum Alloys—32:1, Brass, Bronze and Copper—36:1, Non-Metallics—30:1. Add to this the savings through higher speeds, better finish, greater accuracy and increased production. The total saving not only offsets the higher initial investment cost of Carboloy, but also increases your profit margin on your machining operations. Write for complete details without obligation.

CARBOLOY COMPANY, INC.

2975 E. JEFFERSON AVENUE, DETROIT, MICHIGAN

CHICAGO CLEVELAND NEWARK PITTSBURGH PHILADELPHIA

CARBOLOY CEMENTED CARBIDES

REG. U.S. PAT. OFF.

STANDARD of INDIANA

announces

SIX SUPERIOR NEW OILS

leading the way back to simplification of

CORRECT LUBRICATION

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New! the STANOIL ex
STANOIL
NO. 18
STANOIL
NO. 25
STANOIL
NO. 30
STANOIL
NO. 35
STANDARD OIL C

IL*extette!*

they've "Got Everything!"

Unusually high stability . . . Excellent demulsibility . . . Low pour test . . . Good viscosity index . . . Low carbon-forming tendency . . . Excellent color.

SET down the development of STANOIL as the most important lubrication event happening right now.

STANOIL—in six grades—can do the work of more than twenty-four other types of industrial oils.

This *broad ability*—this versatility—of STANOIL is achieved by the only scientifically correct method: Each grade of STANOIL is made to *combine* more desirable qualities than do any of the individual oils it can replace.

Because each grade of STANOIL is a *medley* of fine qualities it is not only able to replace several other oils, but it is also usually able to do the work of each of them *better* and *more economically.*

With STANOIL, the Standard Oil Company (Indiana) leads CORRECT LUBRICATION *back toward simplicity*—reversing the modern trend, for your advantage.

STANOIL is here to make correct lubrication, economical lubrication, *easier.* Learn just where *you* can use it to simplify your own lubrication practices—profitably.

CORRECT LUBRICATION

MPANY (INDIANA)

STANOIL, used in air compressors, will result in less carbon formation, less gummy deposits on pistons, piston rings and valves than will conventional compressor oils—*because of the unusually low carbon-forming tendency of STANOIL.*

* * * *

STANOIL, used in steam turbine lubrication, results in greater freedom from sludges and less tendency for emulsions to form—*because of the low carbon-forming tendency and excellent demulsibility of STANOIL.* Used in place of conventional turbine oils, it will give longer service with less trouble from deposits —*because of the unusually high stability of STANOIL.*

* * * *

STANOIL, used in bearing lubrication where ring oiling is employed, allows rings on bearings which must be started at low temperatures to turn and supply adequate lubrication at these low temperatures—*because of the low pour test and lesser tendency to thicken up with cold, of STANOIL.*

* * * *

STANOIL No. 25—suitable for compressor lubrication, gas engine cylinder lubrication, turbines, and use on many gears and bearings—illustrates how directly a plant can now simplify its lubricant selections, purchases, storage and application schedules through the use of the STANOIL SEXTETTE.

Copr. 1936, Standard Oil Co.

STANDARD OIL COMPANY (INDIANA

Also check the following monographs that interest you and write for any specific information on lubricati you may desire. Address Standard Oil Company (Indiana), 910 S. Michigan Avenue, Chicago, Illinois.

POWER

- ☐ Steam Turbine Lubrication
- ☐ Diesel Engine Bearing Lubrication
- ☐ Diesel Cylinder Lubrication
- ☐ Steam Engine Lubrication
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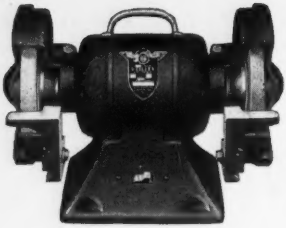

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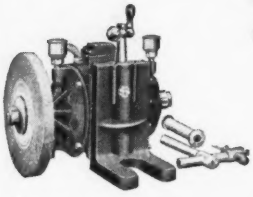

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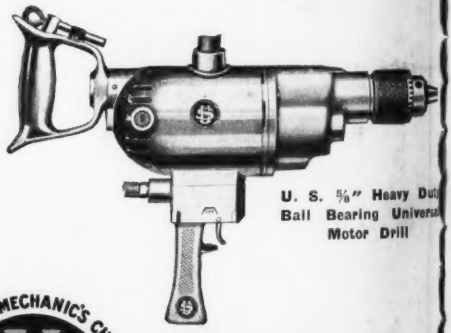

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